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The Investigation of the One Planet Living Framework for WPI

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An Interactive Qualifying Project submitted to the faculty of

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Abstract

Our project investigated the framework provided by One Planet Living (OPL) and determined the plausibility of the use of this framework for WPI's sustainability plan. Our team found that it was plausible for WPI to merge the OPL framework with the sustainability plan and thus created an integration plan. This plan was given to the President's Task Force on Sustainability.

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Executive Summary

Since 1992 BioRegional Development Group, a sustainability-focused organization, has focused on helping communities live in a "planet neutral" manner or in other words, a manner which would require only one planet to sustain if everyone on earth lived the same lifestyle. This lifestyle is a large improvement of the average American or European, whose lifestyles would require five and three planets respectively if everyone on the earth lived a similar lifestyle to their average citizens. This planet neutral lifestyle is accomplished through the implementation of the framework of the global initiative One Planet Living (OPL) developed by BioRegional. It was the goal of this Interactive Qualifying Project to bring the One Planet Living framework to Worcester Polytechnic Institute (WPI).

BioRegional partnered with the World Wildlife Fund to develop this One Planet Living framework. One Planet Living consists of ten wide-ranging principles which go farther than simply trying to reduce the environmental impact of the community. The framework provided by the principles ensures that the community also focuses on the economic, cultural, and social aspect of sustainability. A set of Common International Targets (CITs) defines when each of these principles has been achieved. When the targets are met and the principles achieved, the community has reached the target One Planet Living lifestyle and is officially labeled and endorsed as a One Planet Community. The first objective of this project was to determine whether these principles provided a framework which was reasonable for WPI to integrate into its own sustainability plan. After accomplishing this, the team had to determine to what extent WPI should integrate the principles and how it should be done if the framework is accepted for their sustainability plan.

Currently, there are five endorsed One Planet Communities in the United States, United Kingdom, and Portugal with others planned in South Africa, Australia, China, and Canada. However, there are currently no endorsed One Planet college campuses. Additionally, in the United States there are no colleges or universities which utilize the OPL framework for their campus sustainability plan. Thus, WPI would be the first.

In 2012, a WPI Interactive Qualifying Project (IQP) team worked with BioRegional to increase their visibility and continue to market its efforts. Through doing so, WPI and BioRegional developed a professional connection. During their project, the students and advisors of the IQP team learned about the One Planet Living initiative and, with their sponsor, decided it was something WPI should consider. As a result, a new IQP was developed to focus on bringing the One Planet Living principles to WPI and thus is the purpose of this project. The objectives of this project were to investigate the plausibility of the integration and use of the OPL principles for WPI's sustainability plan, research the potential of WPI becoming the first One Planet Campus, and develop recommendations which can be used by WPI for guidance on integrating the principles into their sustainability plan.

Methodology

The main focus of this project was to determine the plausibility of the adoption of the One Planet Living principles by WPI. The team developed a paper presenting recommendations for how to integrate the principles as the final result of the project. To accomplish this, the project team worked to complete the following objectives.

1. Evaluate the current sustainability efforts made by WPI

2. Investigate the knowledge and opinion of the WPI community on WPI's sustainability efforts
3. Investigate the opinion of the WPI community on the reasonability and plausibility of the adoption of the One Planet Living principles
4. Investigate effective sustainability efforts made by other colleges and universities and/or recommended by college-focused sustainability organizations
5. Develop recommendations for the President's Task Force on Sustainability on how WPI can implement the One Planet Living principles.

In order to complete each of these objectives, the team used document analysis, interviews, a survey, and an interactive presentation.

For our document analysis, we analyzed all WPI annual sustainability reports and the Phase One Draft Report on WPI's progress toward the development of a sustainability plan. We subsequently organized the data according to how it paralleled the goals of each of the ten OPL principles. From the Phase One Draft report and other sources, the team gathered information on successful sustainability efforts made by other universities.

We next conducted interviews with members of the President's Task Force on Sustainability and sustainability-related clubs and organizations on campus to educate ourselves on the challenges, organization, and governance of WPI's sustainability efforts and to educate these individuals on the adoption of the One Planet Living principles.

Simultaneously, we distributed a survey to the students and faculty of the WPI campus community. To increase participation, our team table sat in busy campus locations. We received 421 survey responses (just less than 10% of the total faculty and student population) on WPI's

current sustainability efforts and the plausibility of adopting the One Planet Living principles at WPI.

The team used the interview and survey data as well as the information found on successful sustainability efforts at other universities to compile a list of possible suggestions for changes, improvements, or additions to WPI's sustainability efforts and presented them to the WPI Student Green Team.

Findings

Through the completion of the data collection and analysis, the team found that the implementation of the One Planet Living principles as a framework for WPI's sustainability plan was plausible. The current areas of focus identified in the Phase One Draft Report can be merged with the principles with minimal effort and the President's Task Force on Sustainability recognizes this. WPI could merge the principles in two manners. The first would be to maintain the four current focuses as the overarching framework and to use the principles to achieve them. In other words, by focusing on and achieving the goals of the principles, WPI would also be working toward the achievement of the four focus areas. The second manner for merging the principles into WPI's current framework would be to use the four focus areas to achieve each individual principle. This means for each principle the four focus areas would be worked on within the concentration of that specific principle. By working in the four focus areas for each principle, the goals of the principles would be achieved. Either of these methods of integration could be used to fully implement the ten principles as a framework for WPI's campus sustainability plan.

WPI's current sustainability efforts match the focuses of the principles, with many specifically paralleling the goals of the Common International Targets. For example, 0% of WPI's waste is sent to landfills meeting one of the goals of the Zero Waste CITs. By providing funding and staff time to student projects, WPI is also meeting a goal of the Culture and Community CITs. Additionally, the promotion of healthy diets and active lifestyles ties in with the Health and Happiness CITs. These are just a few of the many examples.

From responses of the approximate 10% of the WPI community surveyed, the team determined that the community is generally knowledgeable of WPI's sustainability efforts and an impressive majority supports the expansion of the current efforts, as well as the implementation of new efforts. A majority of the community showed an agreement that it is plausible for WPI to adopt the principles as a framework for sustainability, with an average agreement or preference of 66.3%.

Conclusions & Recommendations

At the completion of this project, the team concluded that WPI should merge the ten One Planet Living principles into their current sustainability efforts. In doing so, WPI would become the first college to utilize the One Planet Living principles in the United States. WPI is at a convenient point in the development of their sustainability plan to integrate the principles into their current organizational structure. The One Planet Living principles and framework could provide WPI with the support, organization, and direction needed to accomplish our goal of becoming a more sustainable campus and community.

WPI sustainability efforts have already made progress toward achieving certain principles. For example, WPI's culture of civic duty, history of innovation, and strong traditions

meets most goals of the principle of Culture and Community, however, campus operations must be significantly improved to reduce carbon emissions and complete the goals of the Zero Carbon principle. WPI's sustainability efforts partially fulfill each principle. Below is the list of the most recommended suggestions developed by the team to help WPI make further progress toward achieving the ten One Planet Living principles.

1. Utilize roof space of buildings to assist in efficiency and carbon emissions of the building. Some examples of enhanced roofs include white reflective roofs, roof top solar panels, and roof top gardens.
2. Reorganize WPI's recycling program. Investigate the dispersal and placement of recycling bins. Educate the WPI community about recycling on-campus. Initiate an advertising campaign to increase on-campus recycling efforts.
3. Convert WPI's vehicle workforce to hybrid, electric, and biodiesel vehicles.
4. Switch to biodegradable food containers and utensils
5. Investigate creating a student run garden.
6. Better regulate irrigation.
7. Plant more native trees around campus and the surrounding community.
8. Increase visibility, awareness, and engagement in regards to sustainability efforts.
9. Coordinate with existing student organizations to further key themes of the Equity and Local principle.
10. Offer additional healthy food options.

After presenting the findings of this project to the President's Task Force on Sustainability, the team can confidently say that the principles will be considered for an

organizational structure during phase two of the development of The Plan for Sustainability at WPI.

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List of Acronyms

AASHE = Association for the Advancement of Sustainability in Higher Education

ACUPCC = American College and University President's Climate Commitment

ASU = Arizona State University

BedZED = Beddington Zero Energy Development

CITs = Common International Targets

GHA = Global Humanitarian Alliance

HVAC = Heating, Ventilation, and Air Conditioning

IQP = Interactive Qualifying Project

LEED = Leadership in Energy and Environmental Design

MQP = Major Qualifying Projects

OPL = One Planet Living

PTFS = President's Task Force on Sustainability

SAO = Student Activities Office

SGA = Student Government Association

SJSF = Students for a Just and Stable Future

SNAP = Security Night Assistance Patrol

STARS = Sustainability Tracking, Assessment and Rating System

WPI = Worcester Polytechnic Institute

Chapter 1 Introduction

If every person on Earth consumed resources at the rate of today's average North American, it would require five of our planets to sustain the human population. Likewise, if every person consumed resources at the same rate as today's average European, it would require three planets to sustain the population (*One planet living.*). The resource consumption rate of the world population far exceeds the Earth's biological capacity: the Earth's ability to replenish resources and absorb greenhouse gases. This has resulted in an increase in forest destruction, soil degradation, loss of fishing grounds, and climate change (Desai OBE, 2008). The need for change and sustainable development has been recognized by world leaders for more than three decades now (*Stockholm+40 - international.stockholm.se.*2012).

The first global environmental conference was held in Stockholm, Sweden to discuss environmental issues being experienced internationally (*Stockholm+40 - international.stockholm.se.*2012). However, it was not until 1983 that sustainability really took the global scene. In 1983, the World Commission on Environment and Development was created by Gro Harlem Brundtland, the Prime Minister of Norway at the time, to create "a global agenda for change" addressing long-term sustainable development, effective international management of environmental concerns, and strategies for protecting and enhancing the environment among other reasons. Within three years, the commission developed Our Common Future, a book more well-known as The Brundtland Report, which outlined issues such as future endangerment, sustainable development, and concern over limited international involvement. Two years after its publication in 1987, Brundtland spoke at the National Academy of Sciences on her findings boldly stating "Present trends cannot continue. They must be reversed" (Young, 2003). The

report contains several recommendations for improvement which then led governments, individuals, and organizations to become more focused on sustainability. This in turn also led to the development of new sustainability focused movements and organizations.

The first organized commitment to sustainability in higher education, made by University administrators, occurred in 1990 at an international conference held in Talloires, France. The Talloires Declaration was created as an action plan consisting of ten points to be used to incorporate sustainability and environmental literacy into colleges and universities (*ULSF | university leaders for A sustainable future | talloires declaration.*).

In 1992, the United Nations Conference on Environment and Development, informally known as The Earth Summit, was held in Rio de Janeiro. At the earth summit, world leaders, not for profit organizers, and individuals developed Agenda 21, a wide spread plan of action for achieving sustainability. Agenda 21 reached millions around the world due to the nearly 10,000 reporters and journalists who attended the summit (Department of Public Information, 1997).

Also in 1992, the organization BioRegional Development Group was formed. BioRegional, like several other organizations, helps companies, communities, and organizations to develop sustainability plans. To do this, BioRegional partnered with the World Wildlife Foundation to create the global initiative One Planet Living (OPL). One Planet Living provides a framework for achieving sustainability through the implementation of ten principles. To spread BioRegional's sustainability movement and the principles of One Planet, BioRegional worked with an Interactive Qualifying Project (IQP) team from Worcester Polytechnic Institute (WPI) in Worcester, Massachusetts to become a part of the social media scene during the summer of 2012. While working with this team, it was decided that the One Planet Living principles should be

integrated at WPI. WPI has shown its commitment toward becoming a more sustainable community. President Dennis Berkey stated "WPI is moving from a period of growth to a period of sustainability." Those who worked with BioRegional wanted to determine whether the One Planet Living framework could be a viable solution to assist WPI in its movement toward sustainability.

Now during the winter of 2012, our IQP team worked to do just that. We assessed WPI's current sustainability status, gathered the opinion and knowledge of the WPI community on WPI's current sustainability efforts in addition to their opinion on the integration of the OPL principles, and created an integration plan for the One Planet principles which was presented to the WPI President's Task Force on Sustainability.

Because WPI had already begun the development of a sustainability plan, our team was faced with the task of determining whether the ten OPL principles were a plausible framework for WPI to adopt and whether they could be merged into their current efforts and progress toward the development of a WPI sustainability plan. We also needed to determine the attitude and willingness of the WPI community toward WPI's current efforts and the potential adoption of the OPL principles as a framework. Finally, our team needed their research and recommendations to be considered and adopted. Therefore, we needed to present both to those who control WPI's sustainability efforts and are currently working on the development of the sustainability plan. In order to make our plan as feasible, professional, and appealing as possible to those who will be reading it, our team conducted an extensive amount of research into the topic of sustainability, into WPI's current sustainability efforts, into efforts made by other schools or other sustainability focused organizations, and into BioRegional and the One Planet Living principles. Our preliminary research is detailed in our Literature Review.

If WPI chooses to follow our team's proposal and integrate the principles into its sustainability plan, WPI would become the first One Planet Living endorsed higher education institution and, consequently, a recognized leader in sustainability.

Chapter 2 Literature Review

2.1 Introduction

Sustainability is by no means a new topic of conversation and controversy. The Brundtland Report, which was published in 1987, captured one of the early discussions regarding this idea. Since then, the topic of sustainability has expanded as sustainability-focused organizations have developed around the world. Many of these organizations are committed to assisting businesses, communities, and other organizations in creating a climate action plan to help reduce their environmental impact. One such organization is BioRegional Development Group. There are also sustainability-focused organizations committed to specifically helping higher education institutions develop sustainability plans. As one such institution of higher learning, Worcester Polytechnic Institute is looking to further its sustainability efforts. All of these topics will be expanded upon in this chapter.

The focus of this chapter will begin with overarching idea of sustainability, and gradually narrow to concentrate on the progress of Worcester Polytechnic Institute in sustainability. Within section 2.1 of this literature review, we discuss the obstacles of sustainable development and why it is important to overcome them. In section 2.2, we shift our focus to discuss the sustainably-conscious organization BioRegional and how the global initiative One Planet Living was developed. To show how sustainability has become a focus of higher learning institutions, section 2.3 summarizes the efforts of three college-focused sustainability organizations. Finally,

section 2.4 looks specifically into the current sustainability efforts of Worcester Polytechnic Institute.

2.2 Defining Sustainable Development

One of the first widely used definitions of "sustainable development" was written in the Brundtland Report in 1987. This definition, known as the "Brundtland definition," defines sustainability as "…development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Johnston, 2007; *Our Common Future: From One Earth to One World*). Of course there are many definitions that aim to encompass and outline the broad idea of sustainability. The Merriam-Webster Dictionary defines sustainability as "of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged" (Merriam-Webster). According to the website of the Environmental Protection Agency, sustainability is important because it "creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations" (United States Environmental Protection Agency). For the Association for the Advancement of Sustainability in Higher Education (AASHE), sustainability is a broad term "encompassing human and ecological health, social justice, secure livelihoods, and a better world for all generations" (AASHE, 2012). Although these definitions come from a range of sources, they all convey that sustainability, and in turn sustainable development, works for the betterment of the future.

For this project, we have chosen to achieve sustainable development through the OPL principles and their Common International Targets (CITs) (see Appendix A). Sustainable development through the use of the OPL principles will result in and be defined as the use of

resources at a rate such that only one planet is needed to sustain this consumption indefinitely. Our project team has decided on this definition because we will be using the One Planet Living principles to aid Worcester Polytechnic Institute in becoming more sustainable.

2.2.1 The Need for Sustainable Development

While the concept of sustainability is not a new one, only recently has there been realization and discovery of evidence that environmental hazards result from unsustainable practices. One such environmental hazard which is a growing concern is climate disruption. There have been many factors identified as causes of, or contributors to, climate disruption: increased amounts of carbon dioxide in the atmosphere, excessive energy consumption, improper waste management, and non-sustainable food production. All of these contributors to climate disruption can be labeled as unsustainable practices. Through sustainable development, we can prevent or reduce the effect of these unsustainable practices.

Although in order for this to be successful, large efforts must be made to make sustainable development the norm. Today's average North American and European currently use resources at a rate which would require five and three planets respectively to sustain indefinitely (One Planet Living). Sustainable development and sustainable lifestyles must be achieved by a majority in order for the negative effects of our current unsustainable lifestyles to be reduced.

This is where Worcester Polytechnic Institute may step in. If WPI makes strides toward sustainable development through the use of the One Planet Living principles, not only would they be reducing their own impact on the environment, they would also be setting an example for the thousands of higher education institutions in the United States and even for institutions around the world. WPI is a leader in innovation and technology and, through adopting the OPL

principles, they could also become a leader in sustainability. However, if sustainable development is to be achieved, we must first understand the obstacles.

Carbon Emissions

A major environmental problem has developed from excessive amounts of carbon accumulating in the atmosphere. These gases, in combination with water vapor, reflect the heat of the earth thus creating an incubation type effect and ultimately a general warming. The burning of fossil fuels like gas, coal, or oil, releases carbon dioxide into the atmosphere (The Carbon Account). If excessive emissions continue to increase without any efforts to control or reduce emission levels, drastic climate changes are likely to occur (Clark, 2009). Predicted levels of increasing carbon emissions and rising global temperatures are shown in Figure 1. With these projected rises in temperature, it would then be difficult to sustain any life forms that require specific habitat conditions. Rising levels of carbon in the atmosphere pose a threat to the future existence of said life forms, and therefore pose a problem to sustainable development. In order to combat this problem, this issue of energy consumption must also be evaluated.

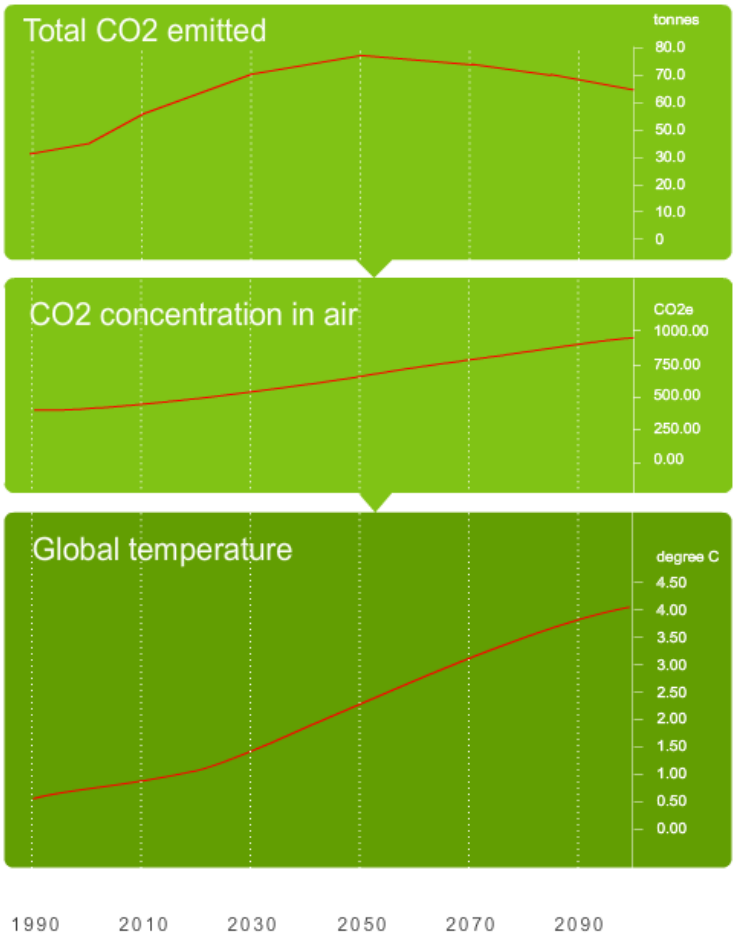

Figure 1: Predicted carbon emission levels and predicted global temperature

Clark, D., O'Connor, M., Bangay, R., Ellis, C. & Roche, R. (2009). Retrieved 09/26, 2012, from http://www.guardian.co.uk/environment/interactive/2009/dec/14/climate-simulator

Energy Consumption

Another part of sustainable development is responsible energy consumption. In order to be sustainable, members of the community must consume energy at a rate which will leave a fair amount for future generations. It is also important that, as mentioned above, carbon emissions related to the production or use of energy be minimized. Currently, about 13.2% of the energy the U.S. produces is renewable energy (U.S. Energy Information Administration, 2011). This is a clear indication that the vast majority of energy production in the United States is unsustainable.

In addition, 83% of energy production produces some form of carbon emissions thereby contributing to global climate change mentioned in the previous section (Energy Perspectives 1949-2011). Around the world, three billion people still rely on in home coal or biomass fires for heat (The Need for Clean Cookstoves, 2011). To avoid drastic climate change and to leave resources for future generations, there must be changes in the way and amount of energy that is produced.

Improper Waste Management

Improper waste disposal is another obstacle to sustainability and sustainable development. It contributes to both negative environmental and health-related effects. When waste is not disposed of properly, greenhouse gases are often released into the atmosphere, where they contribute to global warming and climate change. Waste such as electronics, plastics, and batteries contain toxic chemicals and if they are not managed properly during their disposal, these chemicals can be released into the environment. Toxic chemicals in the environment have the potential to be consumed by both people and animals. Improper management can also prevent reuse of materials like plastics, metal, and paper that have recycling potential. Without reusable resources, more energy is expended to create the same products out of new materials. This process further depletes the earth's natural resources and can take a toll on the environment (Leslie). The poor management of waste disposal has a negative impact on sustainability, as it fails to account for the needs of future generations. The following section discusses how the current process of food production is no better.

Non-Sustainable Food Production

The current system used for food production is unsustainable for a number of reasons. Agricultural machinery used for this production, such as tractors and ploughs, depend on a

constantly shrinking supply of oil. The production process also uses an excessive amount of water, which contributes to a growing water shortage and water-stressed areas. As a result of drastic climate change, there has been an increase in large scale catastrophes such as hurricanes, cyclones, floods and droughts. These catastrophes can cause farming land to become unusable and in turn create food shortages. Industrialized farming is also non-sustainable because it makes use of monocultures (Meacher, 2005). Monoculture is when a single crop is grown for several years in an area, and it causes the area to loose biodiversity (*Monoculture*, 2012). The final stage of production is the transportation of the crops grown to markets or grocery stores. In many cases, food is exported or has to travel long distances. This travel is dependent on gasoline- another natural resource being over-consumed (Meacher, 2005). A number of changes need to occur in the food industry so that it does not take such a toll on the planet and allows for sustainable development. In order for this and other problems facing sustainability to change, individuals and organizations need to take responsibility for the consequences of their actions. WPI and other campuses across the globe can play an influential role to enact this change.

2.2.2 Social Responsibility and Higher Education

Social responsibility is a significant element in sustainability efforts. Members of communities should be knowledgeable on the importance of sustainability and be engaged in sustainability efforts. Higher education communities are in a unique position to model this. In recognition of this fact, the Talloires Declaration was written in 1990. This was the first organized commitment of colleges and universities to focus on becoming more sustainable and incorporate sustainability into their curriculum. The Talloires Declaration provides a ten point action plan that colleges and universities may use to improve upon their sustainability efforts and environmental literacy. The ten points vary from raising awareness to practicing energy

responsibility (Talloires Declaration). Schools must take on the responsibility to educate future leaders of sustainable, environmental, social, and economic change (Worcester Polytechnic Institute). Community engagement is a key element to the success of sustainability as each person must be responsible for their own impact.

Although it is important for colleges like Worcester Polytechnic Institute to engage their communities in sustainability efforts, this is only one of several key aspects. The organization BioRegional Development Group and the global initiative One Planet Living recognize the other factors that are essential for sustainable living and help communities like WPI to integrate them. BioRegional and One Planet Living are described in greater detail in the following section.

2.3 BioRegional

BioRegional Development Group was establishment in 1994 by co-founders Pooran Desai and Sue Riddlestone (BioRegional Development Group, 2012b). BioRegional Development Group is registered as a non-profit organization, and is the parent charity of BioRegional (BioRegional Development Group, 2012c). The first conceptualization of BioRegional occurred two years prior to its creation, when Desai and Riddlestone contemplated ways to reduce the impacts of excessive resource consumption. The pair recognized that to further develop the organization, public education and awareness on the issue of over-consumption was essential (BioRegional Development Group, 2012b).

Integrating local sustainability such as farmer's markets into the public was BioRegional's original objective and is still followed today (BioRegional Development Group, 2012c). The constant progress of BioRegional can be seen in Figure 2 below. The figure shows BioRegional's progress for fifteen years with one major event marking each year.

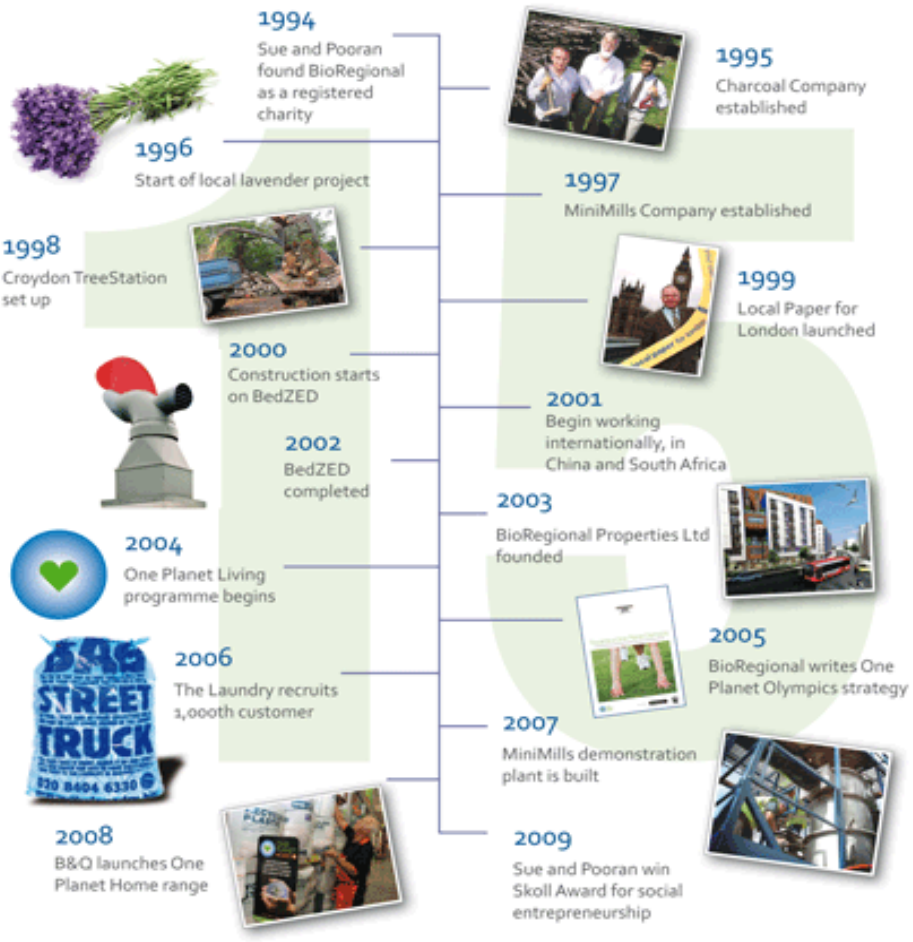

Figure 2: Timeline of BioRegional Development Group's Progress in 15 Years

BioRegional Development Group. (2012). BioRegional: Our history: Timeline. Retrieved 9/25, 2012, from http://www.bioregional.com/about-us/our-history/

2.3.1 Beddington Zero Energy Development

One of the major accomplishments on BioRegional's timeline, depicted above, was the assistance in the completion of the Beddington Zero Energy Development (BedZED) in 2002 in south London. BedZED resulted from the collaborative efforts of BioRegional Development Group, Bill Dunster Architects, the Peabody Trust, Arup, and Gardiner and Theobald (Andrews, 2008). This large-scale eco-village was the first of its kind in the United Kingdom, offering 100 homes, as well as office space for about 100 individuals (BioRegional Development Group,

2012d). BedZED was built with the goal to reduce water use by 33 percent, power emissions by 60 percent, and space heating by 90 percent, which in turn made it a model for future developments (Ockenden, 2007). Factors such as recycling, solar energy, rooftop gardens, and transport were all taken into account to make BedZED a low-carbon emission community. BedZED was also built from the ground up with natural or recycled materials that were locally accessible (Andrews, 2008). Figure 3 below shows the rooftops gardens and solar panels that BedZED utilizes for these housing units.

Figure 3: Photograph of BedZED Rooftops

Andrews, K. (2008). BEDZED: Beddington zero energy development in London. Retrieved 9/26, 2012, from http://inhabitat.com/bedzed-beddington-zero-energy-development-london/

Once the BedZED project was concluded, BioRegional wanted a way to communicate what they learned. To do this, they partnered with the World Wildlife Fund and developed the concept of One Planet Living. (BioRegional Development Group, 2012d).

2.3.2 One Planet Living

The results and findings of the BedZED project were used to create the One Planet Living initiative and its ten principles. The ten OPL principles are depicted in Figure 4 below. With every principle is a brief description, transitioning each broad ideal into a feasible concept for adoption by communities worldwide.

Figure 4: The ten One Planet Principles

BioRegional Development Group. (2012). One planet communities: The 10 one planet principles. Retrieved 9/26, 2012, from http://www.oneplanetcommunities.org/about-2/approach/the-10-principles/

The goal of One Planet Living is to create an "easy, attractive and affordable" lifestyle for the average person so that he or she is willingly living within the means of Earth's resources through the implementation of the ten principles (BioRegional Development Group, 2012e). This is accomplished through the focus on changing the behavior and actions of individuals who form these One Planet communities in addition to the focus on making the community more environmentally friendly (BioRegional Development Group, 2012f). This education of the public is one thing that sets One Planet Living apart and leads to its success.

Through the use of the One Planet principles and the participation of the community members, communities may be labeled as a One Planet Community. BioRegional defines a One Planet Community as "a place where residents could reduce their Ecological Footprint to a One Planet level by 2020" (BioRegional Development Group, 2012f). To assist communities in becoming a One Planet Community, BioRegional created a guide that aids in the application of the OPL principles (BioRegional Development Group, 2012g).

The guide leads to the development of a One Planet Action Plan as can be seen in Figure 5. This plan details how the community will address each of the ten principles and how it will do so as well as in what time frame.

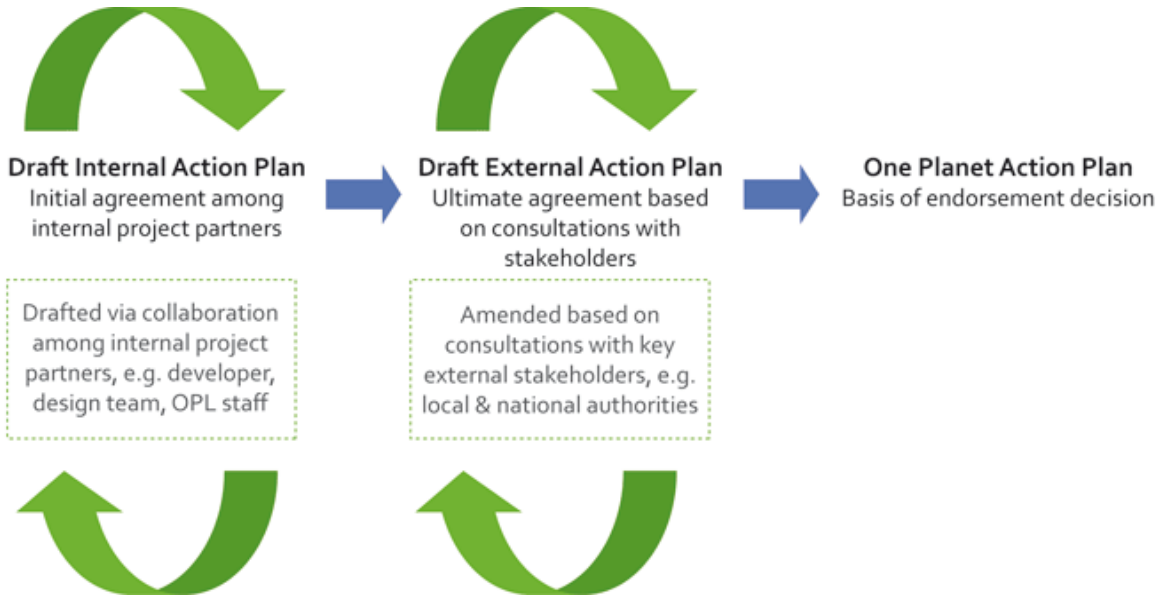

Figure 5: Development of One Planet Action Plan

The plan begins by taking a holistic approach to the problem of achieving sustainability, identifies specific challenges that the targeted community must overcome, and finally focuses on the possible opportunities to overcome these identified challenges. With the challenges of each potential One Planet Community in mind, the action plan suggests practical and economically feasible tactics for applying each principle and then identifies "performance indicators." These indicators are used to help BioRegional decide whether or not to endorse the project (BioRegional Development Group, 2012h).

Because BioRegional does not have the means to fund every project, they created steps that a community must follow to be endorsed (outlined in Appendix A). These steps must be met

before endorsement is granted. In addition to developing a One Planet Action Plan, a project must commit to meeting the preset Common International Targets. The project achieves these targets by implementing the methods defined in their One Planet Action Plan. A project seeking BioRegional's endorsement also commits to submitting an annual review, outlining any progress made at the site, and outlining any areas in which more support would be necessary for the project to continue. Monitoring the progress of a project allows BioRegional to learn what methods successfully make a positive impact on a community's sustainability. Both parties sign a written contract to ensure that each will abide by the agreement. The contract completes the endorsement process, allowing the project to legally use OPL's logo (BioRegional Development Group, 2012i). Currently, five One Planet Communities are all fully endorsed by BioRegional: Grow Community, USA, One Brighton, UK, Mata de Sesimbra, Portugal, Sonoma Mountain Village, USA, and One Gallions.

Upon receiving endorsement from BioRegional, a community then begins the process of implementing their One Planet Action Plan. To ensure a smooth transition for the community, BioRegional sends a "Sustainability Integrator" to further guide the project through each phase it will undergo. As the adoption of the ten principles continues, the annual review is also used to keep the project on course. BioRegional holds the One Planet Communities in high regard and therefore another use of the annual report would be to ensure that their OPL logo remains "a symbol of truly exemplary commitment to, and leadership in, sustainability" (BioRegional Development Group, 2012g). The careful screening of each proposed project conveys BioRegional's passion for and devotion to their One Planet Communities.

One Planet Living and Institutions of Higher Education

From the start, our project description stated that there are currently no campuses in the United States that have adopted the One Planet Living principles. In order to become a One Planet Campus, WPI would need to meet the Common International Targets. However because WPI is neither a fully functioning community nor a true business or organization, WPI would have to work with BioRegional to determine which set of CITs (community specific or business and organization specific) to follow on a principle by principle basis. These targets will assist WPI breakdown each OPL principle into feasible methods by which the campus can implement them.

Currently there are no colleges or universities endorsed by BioRegional. Additionally, there are no colleges or universities in the United States that use the One Planet Living principles in their sustainability efforts in any way. If WPI integrates the OPL principles into their sustainability plan, they will be the first campus in the United States to do so and will also likely assist BioRegional develop a set of college and university specific Common International Targets.

2.3.3 WPI's Relationship with BioRegional

BioRegional recently called upon students from Worcester Polytechnic Institute to aid in spreading word of their mission through social media websites. These students were working with BioRegional as part of their IQP, a project that allows students to travel to one of several different global sites and solve a problem through their knowledge of science, technology, and the local society (Worcester Polytechnic Institute 2012). Through this IQP, BioRegional and WPI developed a professional relationship. The project team and their sponsor, Pooran Desai,

decided the One Planet Living principles should be investigated for WPI's own sustainability plan. It is from this discussion that our project was developed (Tomkinson, 2012).

2.4 College-Focused Sustainability Organizations

There are several organizations both in the North America and around the world that are dedicated to assisting colleges and universities develop sustainability efforts and climate action plans. This section will look into three such examples: the Association for the Advancement of Sustainability in Higher Education, American Colleges and Universities Presidents' Climate Commitment, and GreenerU, Inc.

2.4.1 Association for the Advancement of Sustainability in Higher Education

The Association for the Advancement of Sustainability in Higher Education is a Non-Profit organization focused on furthering sustainability in higher education through empowerment (AASHE, 2012e). AASHE's definition of sustainability includes human and ecological health, social justice, secure livelihoods, and a better world for future generations. To promote their definition, AASHE provides resources on leadership, professional development, and a framework to show the value and edge provided by sustainability initiatives. AASHE began as the Education for Sustainability Western Network in 2001. After it hosted its first conference in 2004, the demand for its resources progressively grew to the point where it needed to expand beyond its regional area to North America. Thus in 2006, the Association for the Advancement of Sustainability in Higher Education, AASHE, was created as the first professional association focused on campus based sustainability in the campus community in higher education (AASHE, 2012d). Currently, AASHE has 885 member and 243 associate members from two and four year institutions, K-12 schools, system offices, businesses, non-

government organizations, and government agencies located across the globe. Worcester Polytechnic Institute is one such member (AASHE, 2012f).

AASHE's services also include North America's largest annual conference, workshops and webinars for professional development, newsletters which include announcements, bulletins, and Sustainability Tracking, Assessment and Rating (STARS) updates, a resource center, the STARS program, an awards program, and the support of the American College and University Presidents' Climate Commitment. These activities are designed to encourage the adoption of sustainable practices, aid efforts to integrate sustainability into teaching, research, operations, and public involvement, promote resource sharing and provide knowledge on best practices, support all portions of campus sustainability goals, increase individual, institution, and external partner collaboration to quicken the adoption process, and impact education policy such that sustainability becomes a focus at local, state, and national levels (AASHE, 2012c; AASHE, 2012d).

Sustainability Tracking, Assessment and Rating System

AASHE developed the Sustainability Tracking, Assessment and Rating System program for colleges and universities to use to measure their performance in sustainability. The STARS program is a non-biased framework that colleges may use to assess and report on their sustainability progress. The STARS program allows colleges and universities to make comparisons with other universities due to the use of common set of measurements. These set measurements also allow colleges and universities to effectively track their own progress from year to year (AASHE, 2012d). The program provides a reporting tool and a technical manual which provides the information used to gather the data necessary for STARS (AASHE, 2012b). STARS rating system is based on 4 categories: Education and Research, Operations Planning,

Administration and Engagement and Innovation. Within these categories are sub-categories and within the sub-categories are sub-sub-categories referred to as credits. For each credit there are different point values which are earned by the universities. The total score of the universities determines the STARS Rating: Platinum, Gold, Silver, or Bronze. Universities may also choose to keep their score private in which case they receive the rating of Reporter (AASHE, 2012c).

Worcester Polytechnic Institute does not currently use the STARS program to evaluate. However in 2009, WPI did participate in a pilot survey for the STARS program and scored an overall 58.01. Including WPI, 37 national universities participated and scored an average of 40.30 (Martinelle, 2009).

2.4.2 American College and University Presidents' Climate Commitment

The American College and University President's Climate Commitment (ACUPCC) is an organization comprised of colleges and universities who are making an effort to address global climate disruption. ACUPCC was developed at the 2006 AASHE conference by Second Nature, ecoAmerica, and AASHE along with twelve presidents and chancellors of Universities in attendance. These twelve presidents then invited nearly 400 other universities to join. In 2007 when ACUPCC officially became public, 284 institutions had joined the signatory group (*Mission and history*). As of June 2012, ACUPCC has nearly 700 signatories (Klein, 2012).

ACUPCC colleges and universities have committed to eliminating net greenhouse gas emissions from specific operations on campus and to promote the research and education efforts of higher education which can assist in the re-stabilization of the climate. By becoming a part of ACUPCC, institutions have agreed to complete an emissions inventory for greenhouse gasses, develop a maximum of a two year timeline with milestones for becoming climate neutral, select

and take immediate actions from a provided list to reduce greenhouse gas emissions, make sustainability an educational experience by integrating it into the curriculum, and to make their action plan and progress reports available to the public (*Mission and history*).

To aid in the achievement of these goals, ACUPCC provides a framework, support, and resources for colleges and universities to utilize. Included in these are comprehensive plans the institutions may use to move toward climate neutrality (*Mission and history.*). ACUPCC has a specific reporting system for the institutions to use to set goals, track progress, and report results. With this, there are instructions defining how to measure and follow the commitments of ACUPCC institutions. These instructions include submitting a greenhouse gas report, submitting a climate action plan, and submitting a progress report (*ACUPCC reports · reporting instructions.*).

2.4.3 GreenerU, Inc.

GreenerU, Inc. is an organization that is entirely focused on helping individual colleges and universities develop a distinctive campus sustainability plan (*Mission | GreenerU.*). GreenerU believes colleges and universities are in the unique position where they can become potential leaders in sustainability while reducing costs in infrastructure and utilities. The founders of GreenerU believe that colleges and universities have the ability to most effectively demonstrate the extensive changes required by a community to become climate neutral (*History | GreenerU.*).

GreenerU works with colleges and universities to develop a sustainability plan specific to the university's needs. This plan can range from reducing energy bills to assistance in meeting the commitments for the American Colleges and Universities Presidents' Climate Commitment. GreenerU can help to create awareness on the college and university campuses, aid in action collaboration with the community, and aid in communication of results. With GreenerU's

assistance, participating colleges and universities focus on energy needs and gaps, comprehensive energy efficiency programs, installation of renewable energy, making buildings high performance, and creating a climate action plan. Once these issues have been addressed, GreenerU also assists the colleges and universities in finding financing solutions for the implementation of plans addressing the above listed needs and gaps(*Why partner with GreenerU?*).

GreenerU is currently assisting ten colleges and universities, one of which is Worcester Polytechnic Institute (*Clients | GreenerU.*). Worcester Polytechnic Institute is currently beginning Phase II of its sustainability plan development with the assistance of GreenerU (Worcester Polytechnic Institute, 2012).

2.5 Sustainability at Worcester Polytechnic Institute

Worcester Polytechnic Institute actively promotes campus sustainability efforts. Through various efforts planned by the President's Task Force on Sustainability, student clubs and organizations, and off-campus organizations, WPI has moved towards creating a sustainable campus. In the following subsections, the efforts of these groups are touched on and the campus' progress and future goals are better defined.

2.5.1 The President's Task Force on Sustainability

The President's Task Force on Sustainability (PTFS) is a committee that consists of WPI faculty, staff, and students who work on WPI's sustainability planning process. The objective of this committee is to advance sustainability throughout the campus and to support the educational mission of teaching sustainability practices and research. The PTFS produces an "Annual Sustainability Report" that describes any operations and accomplishments of WPI for the reporting year. A summary of the report is also available annually as "Year in Review."

(President's Task Force on Sustainability). The PTFS also organized four working groups to focus on sustainability projects and planning on campus. These four working groups include: (1) operation of WPI's campus facilities, (2) academic programs, (3) institution policies that impact sustainability, and (4) on and off campus community engagement.

2.5.2 Development of the Campus Sustainability Plan

WPI has several new sustainability initiatives currently in progress. One of these initiatives is the development of the "Campus Sustainability Plan" by the Task Force in spring of 2012. The Campus Sustainability Plan strives to engage the community both on and off campus to achieve sustainability. WPI consults two different organizations for assistance with their energy consumption: SynergE Worcester and the Energy Task Force. For assistance with the Campus Sustainability Plan, WPI also engages GreenerU, the campus sustainability consulting group discussed in section 2.3.3. In addition to engaging organizations, faculty, staff, and students are actively encouraged to contribute ideas and be part of the movement (Campus Sustainability Plan).

2.5.3 Sustainability Focused Student Clubs and Organizations

As part of the WPI curriculum, the school provides courses, projects, research opportunities, and clubs and organizations to educate and involve students in sustainability and the environment. This includes but is not limited to the Student Green Team, the Eco-Representative Program, the Students for a Just and Stable Future (SJSF), and Global Humanitarian Alliance. These clubs and organizations participate in recycling programs and educational programs for the WPI community. One example is "Recyclemania".

These organizations each strive to tackle sustainability from their own angle. The Student Green Team focuses on both raising awareness and changing habits on campus to promote a

more sustainable school. Their educational programs include a waste audit, The Green Carnival, and other awareness campaigns (Student Action).

2.5.4 Sustainability Assessment

In the past four years, WPI has consistently enhanced the sustainability plan on campus. The Sustainable Endowments Institute College Sustainability Report Card[1] website assigns a letter grade to colleges rating their sustainability practices. It assigns letter grades in the categories of administration, climate change and energy, food and recycling, green building, student involvement, transportation, endowment transparency, investment priorities, and shareholder engagement. In 2008, WPI received a D- grade, which has drastically improved to an A- as of 2011. Also, according to a guidebook released by The Princeton Review, "WPI was named of the nation's most environmentally responsible 'green colleges'" (Seltzer, 2012). WPI completed the AASHE's STARS pilot survey in 2008 and earned accolades in 2009. However, due to a lack of resources, the STARS survey could not have been completed in the past couple years. Recently, WPI has made the decision to complete a portion of the STARS survey this year. Even a partial completion of this survey will help WPI benchmark its current efforts against other colleges and universities and will lead to further completion in future years.

2.5.5 Further Investigation

In order to fully grasp the extent of WPI's sustainability, further investigation needed to be conducted. The team needed to fully understand the range of WPI's current sustainability efforts and the amount of support for them by the WPI community. Additionally, the team needed to determine these efforts and opinions in relation to the One Planet principles. In the next chapter, we discuss the methods we chose to obtain this information. Following our

[1] The Sustainable Endowments Institute College Sustainability Report Card program was postponed and thus will not be used for our research.

Methodology, we summarize and discuss the findings from this investigation in our Findings and Recommendations chapter. This full investigation allowed the team to create educated recommendations for WPI to enhance its sustainability efforts.

Chapter 3 Methodology

3.1 Introduction

The main goals of this project are to determine the plausibility of the One Planet Living principles for the WPI sustainability plan, determine WPI's current progress in the areas of the principles, and to create a plan for their implementation and furthering. To accomplish this, our project team must address the question of how we can integrate the 10 principles into WPI's current sustainability plan. Our team worked to fulfill following objectives:

1. Assess the current state of WPI's sustainability efforts
2. Assess the support of the WPI community on the current efforts and on new efforts
3. Determine the plausibility of the adoption of the principles by WPI
4. Develop recommendations for WPI to assist with the adoption of the principles
5. Gain support from the President's Task Force on Sustainability

Our team created a matrix which we used as a guide for our project objectives. The completed matrix can be found in Appendix B.

To begin, our project team assessed the current state of WPI's movement towards sustainability. We describe the methods used for the assessment of WPI's sustainability status in section 3.2. After this, we determined the level of awareness and support for sustainability, specifically WPI's sustainability, amongst the WPI faculty and student body. Our methods for

assessing the WPI community opinion of the OPL principles, WPI's current sustainability efforts, and the team's suggestions for implementing the principles are detailed in section 3.3.

In section 3.4, we describe the creation of the plan to integrate the OPL principles at WPI. Once a draft plan was developed, the team presented it to the PTFS to gain support for adopting the 10 principles and using the One Planet Living framework to guide WPI sustainability. We discuss our methods for presenting our integration plan to WPI's PTFS in section 3.5.

3.2 Assessing WPI's Sustainability Status

The team assessed the current status of WPI's sustainability plan and the campus's progress in relation to the OPL principles by analyzing recent WPI sustainability reports and conducting several interviews with members of the WPI President's Task Force on Sustainability and other sustainability-focused organizations on campus. Evaluating the current state of the campus sustainability efforts allowed the team to not only benchmark WPI against the OPL principles, but also against other schools in the country focused on sustainability. The following sections 3.2.1 and 3.2.2 detail the methods used by the team to conduct the analysis and interviews.

3.2.1 Document Review

We reviewed various documents that address WPI's sustainability status and summarize WPI's sustainability efforts. It was with these documents that the team researched efforts WPI currently makes which parallel the OPL principles and the intended structure and focus of WPI's sustainability plan. The purpose of investigating these areas was to allow our team to determine how the principles could be integrated into a sustainability plan and preexisting infrastructure.

Our team analyzed the most recent sustainability reports published on and by WPI: The Plan for Sustainability at WPI Phase One Report 2012, the 2010-2012 annual Campus Sustainability Reports, and reports done on WPI's sustainability by outside organizations. These reports conducted by outside organizations include the Sustainable Endowments Institute College Sustainability Report Card, as well as STARS by AASHE. Because these other organizations use a set standard of measurement, the team was able to compare WPI's sustainability efforts with that of other schools and then able to investigate what actions other schools have taken which successfully helped them become more sustainable. Our goal while analyzing all of these documents was to quantify WPI's sustainability efforts and to learn more about WPI's plan for sustainability in the short-term and long-term future. This information was used to help complete our Principles Matrix found in Appendix B. Completing this analysis gave us a clear groundwork of WPI's sustainability efforts and goals from which we could determine the progress needed for the adoption and achievement of the principles.

3.2.2 Interviews

Aside from general research on WPI's sustainability plan, our team conducted a number of on-campus interviews with people actively involved in WPI's sustainability efforts. We decided that interviews with these individuals would give us a better and broader perspective of the campus sustainability efforts. We chose to conduct interviews in order to collect information that had not been detailed in the reports as well as any updated information on occurrences since the publication of the reports. We developed a specific set of interview questions for each interviewee based on their expertise and what information we desired to gather from them (See Appendices C-H). Prior to each interview, the team gained verbal permission to use a voice

recorder. The recording allowed the team members to listen to the interview at any time and confirm the information gathered.

The information collected during the interview process was compiled and sorted by common answers and themes. These themes were sorted by principle when applicable. The responses from these interviews were used to help complete the Principles Matrix found in Appendix B.

Some of these responses were used to help us synthesis or edit our survey questions. More information about our survey can be found in section 3.3.1 and the survey itself can be seen in Appendix I.

Faculty and Staff Interviews

We wanted to gain a perspective on campus sustainability from the different positions and roles of WPI's sustainability efforts. The team wanted to obtain the view point, knowledge, and opinions of members of the WPI faculty and staff. We decided to interview a member of the PTFS, the Facilities Manager (also the Sustainability Coordinator and advisor of the Student Green Team), and a co-chair of one of the four working groups of the campus sustainability plan. These interviews allowed us to gain necessary insight into Phase One of the development of the campus sustainability plan and the status of the WPI sustainability plan working groups.

Student Groups Interviews

As a team, we decided to interview the interim president of the Student Green Team to learn about what the Student Green Team already does on campus and what they have planned for future sustainability efforts on campus (see interview questions Appendix C). The interview with the Student Green Team was another method for us to gather data regarding WPI

sustainability efforts from persons with a different perspective more specifically from that of the students.

We also interviewed the president of SJSF because this student group is focused on the institution's policy rather than efforts. Through this interview, we wanted to learn more of WPI's governance structure on sustainability and the four working groups of the campus sustainability plan. This student was also able to provide information on the internal structure and governance of the PTFS as he was also a student representative of the PTFS.

3.3 Involving the WPI Community in Integration of the OPL Principles

The opinion of the WPI community plays an important role in the development of WPI's sustainability movement. Thus it was important for our team to determine the amount of support for WPI's current sustainability efforts, WPI's potential sustainability efforts, and our project. To determine this, the team distributed a campus-wide survey to assess the stance of the WPI community on the school's current sustainability efforts and on the potential adoption of the One Planet Living principles into WPI's sustainability plan. Section 3.3.1 details how we used the survey to achieve the second and third objectives listed in section 3.1. In the survey, we provided respondents with the option to leave feedback or make suggestions to help implement the OPL principles or to improve WPI sustainability in general. The team chose a number of these suggestions and presented them to the Student Green Team to gather their opinions on feasibility of these suggestions, as this group is quite familiar with campus sustainability. This presentation is detailed in 3.3.2.

3.3.1 Campus-wide Survey

Our team recognized the important role the community plays in WPI's sustainability attempts and thus developed a survey to gather opinions of the student body and faculty of WPI on WPI's sustainability and on our project. We designed survey to specifically gather the knowledge and opinions of the WPI community on WPI's sustainability efforts and their opinions on the focus of our project. We chose a survey over focus groups due to the large number of people that could be reached. The team needed a large enough sample size to determine the general knowledge and opinion of the community.

Using the online service Google Forms, we developed a survey that consisted of both multiple choice and free response questions. The survey can be found in Appendix I. The survey was distributed through the faculty and student email aliases and at two on-campus table-sitting events. We offered candy to participants in an effort to entice more of the campus community to take the survey.

After collecting the data from the survey, we organized it by pertinence to the principles and analyzed it. We then separated the answers by the topic of the question: knowledge on current WPI sustainability efforts, opinion on new efforts, and opinion on integration. Also, we compiled all the suggestions from the free response questions and organized them by efforts thought to be done well by WPI, recommended improvement to WPI's current efforts, and suggested new actions or practices to be implemented by WPI. The project team analyzed the quantitative questions on the knowledge and opinion of the currents sustainability efforts at WPI by percentage of answers in each category on a continuum of agreement. From the survey, we gathered data to develop and support our recommendations for our integration plan. We also used the gathered data to assess the WPI community's awareness of existing sustainability

efforts as well as the community's opinion on the adoption of the principles as a framework for WPI's sustainability efforts. This information was also used to help complete our Principles Matrix found in Appendix B.

3.3.2 Interactive Presentation

Our team selected several suggestions from the community we received via our survey and presented them through an interactive presentation to the Student Green Team. The purpose of this presentation was to receive in-depth feedback regarding specific suggestions for improving campus sustainability. The feedback helped the team achieve the fourth objective listed in section 3.1: develop recommendations for WPI to assist with the adoption of the principles. This presentation utilized the interactive survey website Poll Everywhere, where individuals may use their cell phones to text answers to each question and then replies are displayed anonymously.

We presented our selected suggestions from the survey and our own recommendations. We asked the members of the Green Team to express their opinions regarding the plausibility of implementing these suggestions. We also asked for additional suggestions they would like to see or would rather see implemented. At the end of the presentation, we had a short discussion analyzing the plausibility of using the principles as a framework and implementing certain suggestions for WPI. The result of this interactive presentation allowed us to narrow down our recommendations for each principle and helped provide further details and support for our integration plan.

3.4 Creation of the Integration Plan

All data collected was used by ours team to complete their Principles Matrix, located in Appendix B. From the completed Principles Matrix, our team developed an integration plan detailing what WPI currently does and its progress toward achieving the principles, changes which are preferred by the community or are used at other universities, and recommendations on how to further the progress toward meeting the principles and how these recommendations should be implemented. We presented certain on campus efforts to further WPI's progress toward integration of the principles and how specifically to implement them. The proposed recommendations detailed in the integration plan fulfilled the team's fourth objective listed in section 3.1.

To provide a broad range of ideas for potential suggestions, we looked at the sustainability efforts of other colleges and universities. Because many colleges and universities take part in organizations that rate or promote sustainability plans, we compared the recommendations of organizations like AASHE, University Leaders for a Sustainable Future (ULSF), and ACUPCC, with that which WPI currently implements and with what OPL promotes. The team developed a matrix to display the focus, the regulations or components, the community involvement, and the actions of WPI, OPL, AASHE and two other organizations (See Appendix J). Data from this matrix was used to aid in the completion of the third column of the Principles Matrix which can be found in Appendix B.

3.5 Proposing the Integration Plan to the President's Task Force

Once we developed a draft of our integration plan detailing how the OPL principles can be integrated into WPI's sustainability plan, we presented our findings and recommendations to the PTFS thus achieving the final objective. The purpose of our meeting with the PTFS was to

gain their support for our project and show how they can oversee the recommendations in our plan and integrate the OPL framework into Phase Two of the Campus Sustainability Planning Process. In this meeting, we were allotted 15 minutes to present our project and recommendations. We presented the ten principles, our project goals, the parallelism of WPI's four areas of focus in sustainability and the principles, and reviewed our broad recommendations. After this we went over one of the detailed recommendations from the draft integration plan to provide an example of what they would find when they read the plan.

To assist with the presentation and to expedite education of the committee members on our project, our team created a handout detailing the principles, the purpose of our project, and listing the recommendations our team developed for each principle. Committee members were able to refer to this handout as we presented. The handout also allowed committee members to ask more specific questions about the principles and our recommendations and integration plan.

To ensure our project's deliverables could be easily utilized by the Task Force, our team passed around a document upon which committee members could put their email address if they wished to receive an electronic copy of our integration plan. With the conclusion of this presentation and the dissemination of the integration plan, all goals and objectives of our project were accomplished.

Chapter 4 Findings and Recommendations

4.1 Introduction

After completing the document analysis and our interviews and closing our survey, we began sorting and analyzing the data collected. We organized the collected data and our findings by the ten OPL principles. We then used the data to complete the Principles Matrix and

Sustainability Plan Comparison Matrix which can be found in Appendix B and Appendix J respectively along with several charts and graphs which can be located in Appendices K through O. These charts and graphs address the three areas of our research: (1) WPI sustainability efforts which parallel the principles, (2) campus community knowledge of WPI sustainability efforts, and (3) campus community opinion on the plausibility of the adoption of the principles by WPI. We used data from these charts and graphs to support our recommendations. For specific data and a more complete view of the data gathered, please refer to Appendices K through O.

In this chapter, we discuss our findings on WPI's current sustainability efforts and on the opinions and knowledge of the WPI community in relation to these efforts as well as their opinions One Planet Living principles. We also present recommendations we developed for WPI's improvement in the area of each principle. In section 4.2, we present the findings and recommendations for each principle starting with Zero Carbon and continuing through all the principles to Health and Happiness. Also in the individual sections of each principle, we describe in detail one specific recommendation. The team chose these detailed recommendations for their ease and feasibility of implementation, the potential time needed for implementation, and their potential impact. In section 4.3, the team presents our broad recommendations which are designed to help WPI's sustainability efforts in general. Many of these recommendations have the potential to also assist with several of the principles if implemented.

4.2 Principle Specific Findings and Recommendations

The team organized our findings on WPI's current efforts by principle and discussed them in the following sections. These findings can also be viewed in a more condensed format in Appendix B. The team also developed recommendations to assist WPI make improvements in the area of each principle. We created individual tables for each of the principles to display the

team's list of suggestions WPI could use to make progress toward achieving the CITs as well as information on how and why these recommendations should be implemented. From this list, the team selected and described in detail one suggestion that was deemed most plausible for WPI to implement for that principle. Plausibility was determined by the amount of time it could take to implement the suggestion, the impact the implementation will have, and the economical rationality of the choice for WPI.

4.2.1 Zero Carbon

WPI has made many efforts to reduce their carbon impact. WPI's efforts range from the monitoring of building operations, the renovation for or construction of buildings with energy efficiency in mind, to the source of the energy used. Aside from the energy provided by solar panels to light a few streetlights and to preheat the pool water in the recreation center, WPI purchases its electricity from National Grid. According to National Grid, a majority of our energy, just over 40%, comes from Natural Gas. Approximately 30% of the electricity provided to WPI comes from nuclear sources, with coal providing 10%, Hydroelectric and Non-Hydro Renewables providing approximately 5% each, and finally 1% is generated via oil. In addition, WPI's power house also uses mostly natural gas to heat the campus from October to April. In fact, as of the end of the fiscal year 2012, less than 1% of campus heating was provided by oil (Campus Sustainability Report, 2012).

WPI makes efforts to monitor its energy use. Meters have been installed on eleven campus buildings to allow for the determination of energy use patterns for each building (Tomaszewski, 2012). With these meters, WPI could address comments made on our survey about the need for a better regulated lighting and heating, ventilation, and air conditioning (HVAC). Ten survey takers stated that WPI's HVAC needs to be fixed or better controlled when

asked what they would like to see changed, added, or improved in relation to WPI's sustainability efforts. In addition, comments were also made in relation to lighting. Fifteen responders expressed a desire for lights to be turned off either at night or when buildings or rooms are not in use. Thirteen responses mentioned either motion or time controlled lighting. To see all survey responses, refer to Appendix O. Survey takers were also asked to rank the suggestion of the implementation of motion controlled lighting and/or HVAC on a continuum of preference. As shown in Figure 6, 79% of the surveyed community marked that this suggestion was either preferred or most preferred. Some campus buildings, individual classrooms, and residence halls currently implement motion detectors for light control. This was mentioned by

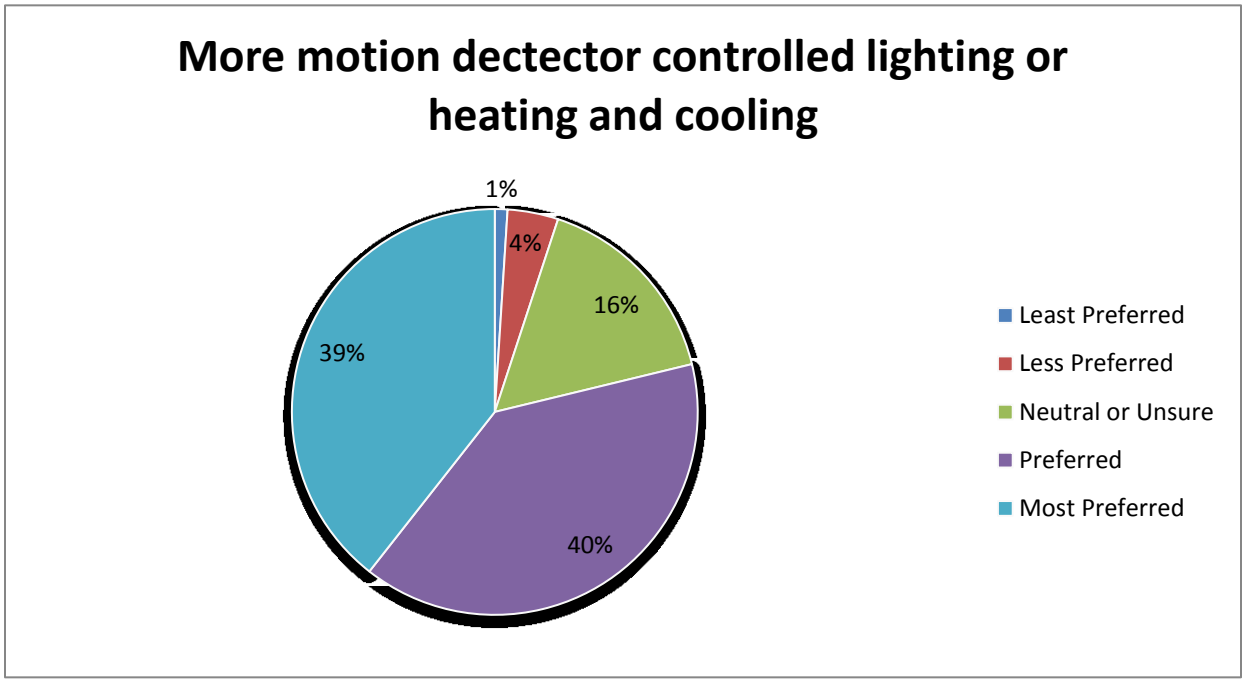

Figure 6: Community opinion on motion controlled lighting

four survey takers under the free response asking what WPI does well in relation to sustainability.

Other efforts have been made to assist with energy reduction for WPI's campus. All appliances provided by WPI in the residence halls are energy star rated. East Hall was built to

reach a Gold certification from Leadership in Energy and Environmental Design (LEED) and uses approximately 32% less energy than the average building of its size (Campus Sustainability Report, 2010). This is in part due to the reflective white roof and rooftop garden which allow the temperature of the building to stay cooler in the sun. Other buildings have similar features for building temperature regulation: for example, the thermal windows installed in Alden Hall and the Project Center reduces heat loss. These adaptations along with WPI's requirement for all new construction to be rated as LEED Certified and the general effort to make all renovations "green" were mentioned by approximately 53 survey takers in response to the question asking what WPI does well. The sports and recreation center and the water bottle refill stations, the high efficiency hand dryers, and the 35 solar panels on its roof were also mentioned a combined 41 times for the question asking what WPI does well. Along with these responses, the survey also showed the community interest in increased sustainability efforts on campus. To view the list of all things listed by the WPI community that are believe to be done well, refer to Appendix N.

The suggestion of implementing more solar panels like those on the rooftop of the sports and recreation center was posed to the survey takers and 83% responded with preferred or most preferred, as shown in Figure 7. The suggestion of installing wind turbines on or around campus was also posed to survey takers and 64% responded preferred or most preferred, as shown in Figure 8.

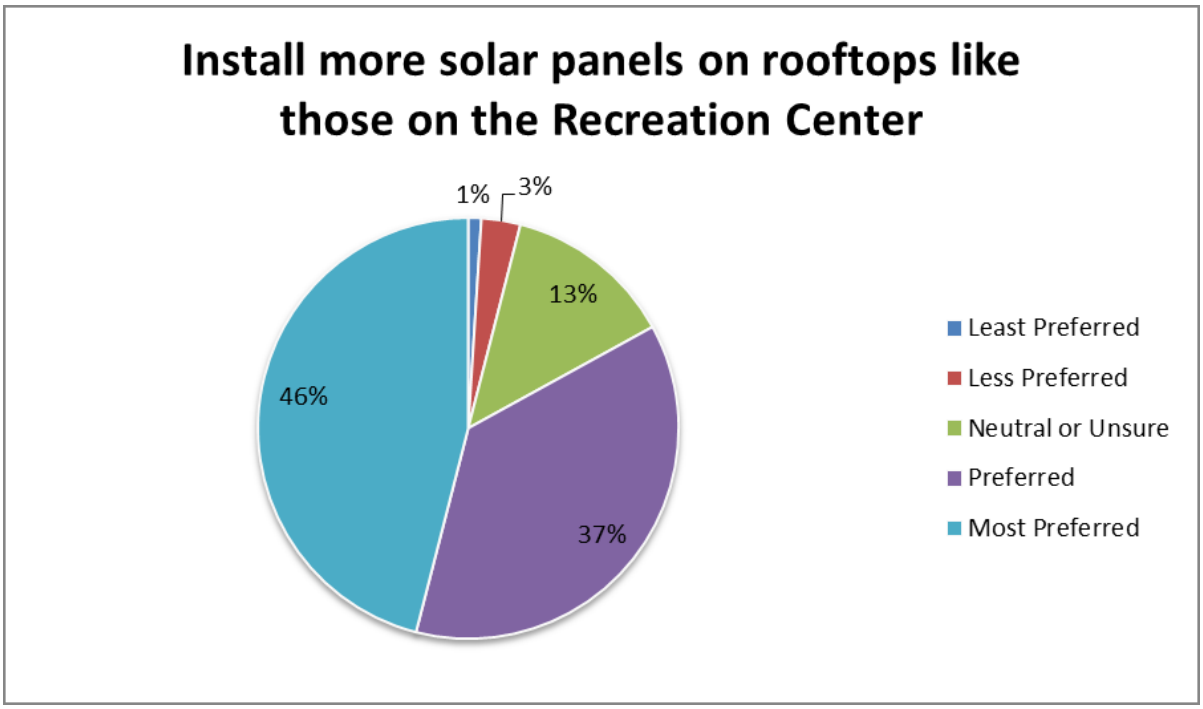

Figure 7: Survey question asking for opinion on rooftop solar panels

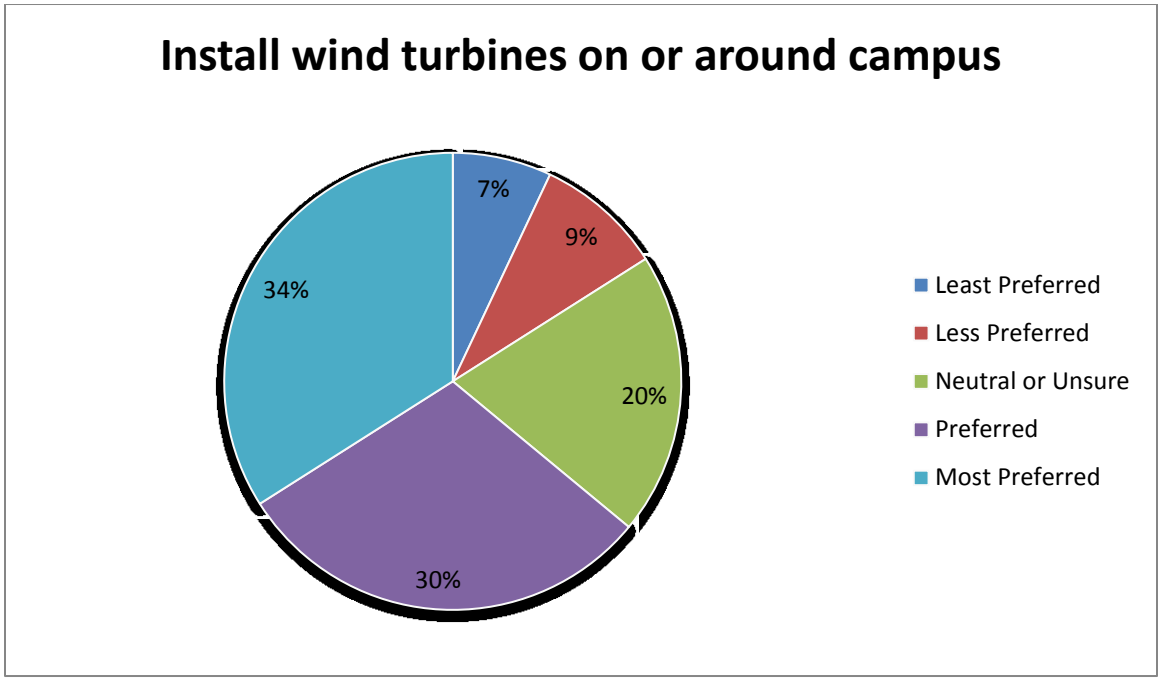

Figure 8: Survey question asking opinion on wind turbines

In our interview with a chairman of the President's Task Force on Sustainability, the subject of renewable energy was also touched upon. He brought up the point of cost-benefit and whether it would be responsible of WPI to fully invest in renewable energy to meet the Zero Carbon Common International Targets. He did, however, state that WPI is working toward using more renewable energy and that WPI had set goals addressing this in the Phase One Draft Report. Also included in the Phase One Draft Report were the results of WPI's efforts to determine its current progress in reaching the goals laid out in the report.

In its efforts to benchmark the current status of its campus operations, WPI calculated its Carbon Footprint with the Clean Air Cool Planet Carbon Calculator utilizing information provided from the Massachusetts Department of Environmental Protection Source Registration and Greenhouse Gas Reports. WPI's total emissions have increased about 5% per year since 2007 however at the same time, the emissions per student has decreased approximately 1% per year since 2007.

Zero Carbon Recommendations

WPI has already made strides in reducing its carbon footprint. However, given the expense of such initiatives, options must be weighed carefully. Even as the administration weighs the costs and benefits of green technology, the popularity of carbon reduction with students is an encouraging sign for the future of WPI and offers leverage for the Task Force and sustainability advocates to reconsider their decision not to solely rely on green technology for its electricity needs. Though energy emissions have increased, current and future sustainability efforts could potentially slow and eventually decrease energy usage.

To assist with this needed reduction of emissions, our team has researched and made recommendations to WPI. These recommendations were determined by the team to help WPI

make the first steps toward meeting the goals of the CITs for the Zero Carbon principle. The CITs may be reviewed in Appendix A. All recommendations made by the team can be viewed in Table 1 along with the some supporting evidence of why the team believes WPI should follow these recommendations as well as how WPI should go about doing so.

The most highly recommended suggestion for WPI is to utilize its roof space. The utilization of roof space can be a less invasive, more passive way of increasing building efficiency and reducing a building's carbon emissions. Due to WPI's large amount of roof space and the height and spacing of these buildings, WPI has great potential for on-sight solar power, utilization of white roofs, and the installation of roof top gardens. These installations have benefits in addition to those which fall under Zero Carbon. Roof top gardens and white roofs can be designed to assist with storm water runoff which assists with targets of the Sustainable Water principle. Roof top gardens can produce food which could also help WPI meet the Local and Sustainable Food target.

Recommendations	Support	Implementation
1. Utilize roof space of buildings to assist in efficiency and carbon emissions of the building. Some examples of enhanced roofs include white reflective roofs, roof top solar panels, and roof top gardens. 2. Better controlled lighting and heating, ventilation, and air conditioning systems. 3. Earn points from the Energy & Atmosphere LEED credit library. 4. Install wind turbines.	1. East Hall currently utilizes a rooftop garden and white reflective roofing. 83% of surveyed community supports the installation of rooftop solar panels and 77% support rooftop gardens for WPI Solar power is used successfully by many universities: Princeton University installed a 5.3MW system in 2012 2. Motion controlled lighting already installed in some on campus buildings and residence halls Approximately 75% of campus in control of an autonomous control system 79% of surveyed community supports motion controlled lighting and HVAC 3. This will assist in accomplishing the above recommendation of improving the LEED rating of new buildings. 4. 64% of surveyed community supports the installation of wind turbines on or around campus	1. IQP teams to determine roofs to be utilized IQP to select plants and design for rooftop gardens Sustainability Coordinator or PTFS should work with Facilities for installation 2. Facilities to update and expand preexisting control systems Student Green Team to survey community on worst buildings on campus for climate control 3. The Sustainability Coordinator or PTFS would work with facilities and construction managers to ensure the design would include this. 4. The Sustainability Coordinator or PTFS would work with facilities and professional consultants to determine locations and install turbines. IQP team could determine feasibility of wind power for WPI

Table 1: Zero Carbon

The suggestions listed in the table are also supported by the community. Of the 421 students and faculty surveyed, 77% stated the implementation of more green rooftops like that of East Hall was Preferred or Most Preferred. Also when asked about the installation of more solar panels, 83% of the surveyed community responded Preferred or Most Preferred. The suggestion to install white reflective rooftops came from a survey respondent answering the question "In relation to WPI's sustainability efforts, what would you like to see changed, improved, or added?" The WPI community is not the only community supportive of utilizing roof space with solar panels. As of September of 2012, Arizona State University (ASU) surpassed 14.5 megawatts of potential solar energy generation. ASU has rooftop solar panels at three of their four campuses. However, ASU did not stop there. Solar panels were installed over parking lots to collect the sun's power as well as shade the cars parked underneath. On top of this, ASU has set a goal to achieve 20 megawatts of solar power generation by 2014 (Craft, 2012). This is an example of the great extent to which solar power may be implemented. Smaller systems are more commonly found such as the 5.3 megawatt system recently installed at Princeton University (Seltzer, 2012).

For roofs that are inappropriate for solar arrays due to shading, lack of space, et cetera, we recommend that WPI investigate the feasibility of installing rooftop gardens or white reflective roofing. For future buildings, the responsibility of implementation falls on the designers and company with which WPI partners for the construction of the building. The President's Task Force on Sustainability or a future Sustainability Coordinator or Sustainability Office should work with the construction managers to ensure roof space is appropriately utilized. Existing buildings, however, can be approached taking advantage of the intellectual capital at WPI. The use of the roof space for each building for solar, reflection, or gardens may be assessed

by an Interactive Qualifying or Major Qualifying Project team. Likewise, after this is completed, the implementation of each assigned use for the rooftops can be done by IQP or Major Qualifying Projects (MQP) teams as well. These teams can work with the President's Task Force on Sustainability to determine which solar panels to use and where to place them on the roofs, which material to use for reflection, or which plants to plant and then the teams may assist with implementation. In completing these projects, the teams should look to preexisting examples both on and off campus such as the solar panels on the roof of the Sports and Recreation Center and the garden and white roof on East Hall and examples such as the successful solar generation of ASU.

4.2.2 Zero Waste

Through analysis of our data collected from our interviews, survey, and document analysis, we discovered that improvement on waste management has been a focus at WPI since fiscal year 2006. According to the data presented in the 2012 Campus Sustainability Report, there has been a 5.7% decrease in the average waste per student per year since 2007.However, the rate of recycled material has stayed approximately the same at 25% of the total waste produced (Campus Sustainability Report, 2012).

WPI makes efforts to continue to reduce their waste production and increase their recycling rate through community engagement, education, and waste diversion. WPI hosts an annual waste audit and participates in RecycleMania. The Green Team helps organize these events and smaller events advertising recycling and other green initiatives such as PREcycleMania and the Sustainability Pledge. Efforts to divert waste are made around campus as well. Many departments have made efforts to reduce waste by going paperless. All professors

are expected to post course information and the course syllabus online rather than printing it and many faculty members post notes and assignments online as well.

WPI has an expansive paper, plastics, glass, cardboard, aluminum, and battery recycling program. According to our survey responses, recycling bins are very visible around campus. When asked to rank the statement "I recycle when on campus" on a continuum of agreement, 92% responded agree or strongly agree. On the same continuum, survey takers were also asked if "There are enough recycling bins on campus." The combined percentage of agreement and disagreement was 51% and 35% with the two extremes at 13% and 8% respectively. This data can be seen in Appendix M. In addition, 127 responses to the free response question asking the survey taker's opinion on what WPI does well mentioned some form of recycling. Responses relating to this recycling program can be found in Appendix N. Likewise, recycling was mentioned 81 times in the free response asking the survey taker's opinion on what WPI could add, change, or improve. These responses can be seen in Appendix O. Apart from this passive recycling, WPI also hosts electronic recycling drives where they collect old and used electronics and donate them or dispose of them appropriately.

To assist with food waste, WPI participates in a form of food recycling. Waste from the dining hall on campus is separated and all food waste is donated to local pig farms. Additionally, organic waste generated in the upkeep of the campus grounds is sent to an outside contractor for composting. However, even with the extent of the recycling efforts on campus, Elizabeth Tomaszewski stated in our interview that the 25% rate of recycling was below the national average (Tomaszewski, 2012).

In addition to the recycling efforts, WPI also makes efforts to reduce waste produced during construction and renovations on campus. A demonstration of this was the 93.4% of waste that was diverted from landfills during the construction of East Hall and the 94% of waste that was diverted from landfills during the renovation of Goddard Hall (Campus Sustainability Report, 2012). Also, at least 75% of the waste involved in the construction of the new sports and recreation center and attached parking garage is expected to be diverted as well (WPI Breaks Ground for a Stunning – and Sustainable – Sports and Recreation Center, 2010). WPI's final effort in waste diversion is the diversion of its non-recycled waste from landfills. According to the 2012 annual Sustainability Report, all non-recycled waste generated by WPI is sent to a waste-to-energy incinerator.

Our survey results have validated a clear fact: the WPI community remains uninformed of much of WPI's sustainability efforts in waste diversion. One question on the survey asked the survey taker's opinion on the plausibility of the adoption of the principles, which can be found in Appendix L, and Zero Waste received the highest combined percentage of disagreement at 26%. This suggests that either the community does not know the extent of WPI's waste management efforts or the community simply does not believe a significant reduction of waste is reasonable for the WPI campus. Ironically though, certain responses to the free response questions of the survey demonstrated a willingness to make efforts toward reducing certain types of waste such as disposable water bottles. When asked their opinion on what WPI could add, improve, or change, 7 people mentioned the ban of the use and sale of bottled water on campus. The water bottle refill stations located in the campus center were also mentioned a total of 34 times in both free response questions. Many of these mentions were asking for more of these stations to be installed

around the rest of the campus. The responses on bottled water and on the water bottle refill stations may be found in Appendix O and N respectively.

Zero Waste Recommendations

While WPI does make large efforts to reduce waste production, improvement needs be made. Table 2 displays recommendations developed by the team designed to assist WPI in making progress toward the CITs for the Zero Waste principle. The table includes support or evidence why the recommendations were made for WPI and finally, the responsibility of implementation has been suggested for each recommendation.

We decided that the suggestion that was easiest to implement and has the greatest potential for immediate success is the reorganization of the current recycling efforts. These efforts could help WPI strive to meet and exceed the national average recycling rate. A highly visible recycling campaign could also help foster a change to the culture of the school and campus community.

To make this change a reality, areas around campus should be surveyed to determine which are lacking certain recycling bins and which have an excess of certain bins. Trash bins should be accompanied by recycling bins both inside and outside of campus buildings. All recycling bins should be labeled with what the bin is collecting: paper, plastic, aluminum, and glass or batteries. Posters should be hung over each group of recycling bins to prevent contamination and ensure the proper items are being placed in the bins. The information on these posters should also be displayed and conveyed to the community through other methods as well such as through email, Orgsync, Facebook, and New Student Orientation materials.

The implementation of these recommendations must be a collaborative effort. The PTFS or future Sustainability Coordinator should work with facilities and an IQP team to complete the required tasks for reorganization of the recycling program. The IQP team would determine which areas need more recycling bins and which areas have extras that can be relocated. This data would be reported to the PTFS who, with facilities, would order and place the new bins. The PTFS would also work with the IQP team to distribute the signage for the promotion of and education on recycling.

The reorganization and promotion of WPI's recycling program could help WPI to make big strides in waste reduction. It is recommended that the other suggestions listed above are implemented in addition to the reorganization of the recycling program to assist WPI in making significant progress toward the CITs.

Recommendations	Support	Implementation
1. Reorganize WPI's recycling program. Investigate the dispersal and placement of recycling bins. Educate the WPI community about recycling on-campus. Initiate an advertising campaign to increase on-campus recycling efforts. 2. Install high efficiency hand dryers and place stickers on remaining paper towel dispensers encouraging sustainable use of the paper. 3. Phase out the sale of disposable plastic water bottles on WPI's campus. Install additional water bottle refill stations such as those in the recreation center. Provide incoming freshman with reusable water bottles as a part of the Insight Program.(see http://www.wpi.edu/academics/Undergraduate/FirstYear/insight.html for more information)	1. 76% of the survey community supports adding more plastic, aluminum, and glass recycling bins 79% of the survey community supports adding more paper recycling bins 67% of the survey community supports adding more battery recycling bins 2. The high efficiency hand dryers in the recreation center were mentioned several times in our survey in relation to what WPI does well with sustainability efforts. 72% of surveyed community support the installation of high efficiency hand dryers Similar stickers are located on paper towel dispensers in the Campus Center and received many mentions in our survey. 3. Worcester Community Project Center IQP focused on the ban of the disposable plastic water bottle. Colby University removal of disposable water bottles from major campus venues saves 10,000 bottles a year.	1. IQP team, PTFS or Sustainability Coordinator, and Facilities collaborate to determine areas with too many and too few recycling bins, to order additional recycling bins, and distribute or redistribute recycling bins. 2. PTFS or Sustainability Coordinator and Facilities to determine best locations for installation of dryers and for actual installation of dryers. 3. Student Green Team to promote to campus community and PTFS to campaign for removal of bottles from campus venues and events.

Table 2: Zero Waste

4.2.3 Sustainable Transport

According to One Planet Living's Common International Targets, sustainable transport means reducing the need for car travel, giving the community access to types of sustainable transport, and investigating "green" vehicle technology (Appendix I). WPI has already made great strides towards the concept of this One Planet principle. Our team gathered information related to Sustainable Transport through our document analysis, interviews, and survey of the WPI community. We discuss our findings below.

As early as September of 2008 two Zipcars-both 2008 Honda Civic Hybrids-were available on campus to members of the WPI community (Campus Sustainability Report, 2010). Zipcar is a car-sharing company that provides vehicles to individuals on demand and is the world's leading network in this field (Zipcar, 2012). Through our interview with Elizabeth Tomaszewski, we learned that she was responsible for bringing another ride sharing program to campus (Tomaszewski, 2012). In 2010, the website Carpool World was launched by the PTFS, a group in which Ms. Tomaszewski plays a major role (Campus Sustainability Report, 2010). Carpool World is a free service through which WPI community members are matched with each other to reap the benefit of a cheaper and more environmentally friendly form of transportation: carpooling (Datasphere Corp., 2012). The institution also allows its members easy access to public transportation. Specifically in the city of Worcester, the Worcester Regional Transit Authority, the City Ride, the Gateway Shuttle, and the Security Night Assistance Patrol (SNAP) service are all alternative means of travel (Worcester Polytechnic Institute). By both providing greener forms of transportation, as well as the ability to reduce the number of cars on the road, WPI has already begun to adopt the principle of sustainable transport. We also found that there is support for implementing the principle of sustainable transport. Of those who responded to our survey, 61% either Preferred or Most Preferred the adoption of Sustainable transport (see

Appendix L). This shows that if WPI were to incorporate this principle within its current sustainability efforts, a majority of the community would support it.

Sustainable Transport Recommendations

From the survey responses, interviews, and document analysis, we formed two recommendations to help WPI progress its sustainability efforts. These recommendations are listed in Table 3 below along with information on why our team believes these recommendations would be successful and how WPI could implement them.

Of the two suggestions, the first is most recommended for WPI as it is deemed to make the greatest impact even though the second is more easily implemented. It would greatly reduce the transportation-related carbon footprint of the school if SNAP vans, facilities vehicles, and shuttles were converted to be or replaced with more sustainable transportation modes, such as biofuel, electric, or hybrid engines. These vehicles run for an excessive amount of hours per week and thus if the emissions from each vehicle was eliminated or significantly cut down, there would be a considerable reduction in the emissions produced by WPI's vehicle workforce.

There are different methods of going about the conversion of campus vehicles. The combination of all methods to produce the most efficient and cost effective conversion is recommended. The first method would be to simply replace the different means of transportation with biofuel, electric or hybrid vehicles when the current ones reach the end of their lifecycles. Vehicles can also be sold or auctioned off to assist with the cost of replacing the vehicles. The last method for the conversion of the workforce is the physical conversion of the vehicles. Biodiesel conversion kits can be purchased for any diesel vehicles in the workforce. Due to the varying costs and benefits of each method, we recommended that each method be thoroughly

investigated to determine the most time efficient and cost effective manner to convert the vehicle workforce.

The second suggestion listed below is also recommended to maximize the reduction of WPI's transportation related carbon emissions. The addition of reserved preferable parking spaces for sustainable transportation would demonstrate WPI's desire to include the community in adopting sustainable methods of transport. By implementing both suggestions, WPI will make significant progress toward the Common International Targets for the Sustainable Transportation principle.

Recommendations	Support	Implementation
1. Convert WPI's vehicle workforce to hybrid, electric, and biodiesel vehicles. 2. Reserve additional parking spots for carpoolers and low carbon vehicles in preferred locations.	1. It would greatly reduce the transportation-related carbon footprint of the school. 2. It would demonstrate WPI's desire to include the community in adopting sustainable methods of transport. 61% either Preferred or Most Preferred the adoption of this principle (Appendix L)	1. An IQP group would collaborate with the President's Task Force on Sustainability using one or all of these three methods: a. Replace the different means of transportation with biofuel, electric or hybrid vehicles when the current ones reach the end of their lifecycles. b. Vehicles can also be sold or auctioned off to assist with the cost of replacing the vehicles. c. Physical conversion of the vehicles: biodiesel conversion kits can be purchased for any diesel vehicles in the workforce. 2. Facilities could work with the President's Task Force on Sustainability to set aside parking spots for these vehicles.

Table 3: Sustainable Transport

4.2.4 Sustainable Materials

The Sustainable Materials principle embodies using sustainable, healthy products that are sourced locally, and made from renewable or waste resources. Our team gathered information related to Sustainable Materials through document analysis, interviews, and a survey of the WPI community to learn about WPI's practices related to this principle. Since February 2007, WPI has committed to designing all new buildings to meet LEED certification (Worcester Polytechnic Institute). Many survey respondents indicated that "WPI does a good job of ensuring that all new buildings and renovations are green." Refer to Appendix N. Despite that, survey respondents expressed that WPI can do better than LEED certification. This may be due to the fact that WPI is only requiring the minimum LEED certification and not require LEED gold, silver, or platinum (Worcester Polytechnic Institute).

One particular LEED certified building, East Hall, has been awarded LEED Gold certification, and there are many sustainable features in this residence hall. WPI purchased furniture from companies with sustainable production processes and environmental friendly factories. The wood on the first floor of this building is Forest Stewardship Council certified cherry wood and not from illegal forest harvesting. Any leftover wood from the building was used for other projects and not wasted. Some of the fabric on the furniture was made from recycled yarn and other similar materials. This furniture was also wrapped in blankets for delivery to reduce packaging waste. Furniture for lounge areas was designed with easily replaceable components to extend its life cycle. When East Hall's construction was completed, 95% of construction materials from demolition and construction were recycled. East Hall exemplifies the campus's use of sustainable materials and commitment to sustainability (WPI

Residential Services). If WPI keeps up the good practice of sustainable materials and sustainable sourcing in their buildings, then WPI would come closer to achieving this principle.

WPI certainly makes efforts to use sustainable materials on campus. Currently, WPI Residential Services supplies green cleaning products for all apartment residents. These products are made with natural ingredients, and, therefore cause less damage to the environment (WPI Residential Services). However, our survey and interview results indicate that the WPI community wants to see more efforts including a greater focus on what types of chemicals are used in cleaning. It was also requested in the survey feedback to use biodegradable food containers on campus, as seen in Appendix O. From the data collected, the team sees that the WPI community expresses concerns regarding sustainable materials in a spectrum from materials in buildings and renovations to materials used by individuals of the WPI community.

Sustainable Materials Recommendations

Through our research, the team found that more attention needs to be given to the focuses of the Sustainable Materials principle which are using sustainable, healthy products that are sourced locally, and made from renewable or waste resources. The team developed recommendations for WPI to further their progress towards this principle. Table 4 lists these recommendations for WPI, as well as the support for these recommendations and how they might be implemented.

Of the recommendations listed in the table, adopting biodegradable containers and utensils is our recommendation for WPI. It is the most plausible as it would take the least time to implement. As stated previously, this recommendation was a request of the WPI community. There are a number of companies which already do bulk orders of biodegradable

supplies including Biodegradable Store, Greentooth and Prime Ware. Take-out containers for hot goods, clear clasp containers for salads, utensils and cups could be replaced with biodegradable alternatives. With advertisement this would be a highly visible change on the part of WPI. The use of biodegradable containers would reduce the amount of non-degradable waste produced by consumers on campus. Implementing this idea would provide another visible, marketable example of WPI adopting the One Planet Living sustainability principles.

To implement the suggestion of biodegradable containers and utensils, the administration should consult with Chartwells regarding the feasibility and costs of such measures. WPI should push for biodegradable containers and utensils to be adopted at Outtakes, the Campus Center food court, Morgan Dining Hall (to-go meals), and the Goats Head (to-go meals). In addition, WPI should make students aware of these changes to reassure them of WPI's efforts. This measure could reduce the environmental impact of the WPI community.

Recommendations	Support	Implementation
1. Switch to biodegradable food containers and utensils	1. This will reduce impact from a common source of non-sustainable waste.	1. Start purchasing biodegradable food containers and utensils. Use existing containers and utensils first, and then switch to new biodegradable ones.
2. Strive to earn LEED platinum certification	2. This will help points in the Materials and Resources credit library helps achieve this principle and helps achieve LEED platinum certification.	2. Follow the criteria in the Materials and Resources credit library and earn points.
3. Develop a set of standards to assess companies' processes and sources.	3. WPI lacks progress in sustainable sourcing of goods.	3. WPI can delegate a person or people who are responsible for purchasing materials to develop a set of standards to assess companies' processes and sources. WPI can seek to purchase products that meet U.S. Green Building Council approved programs.

Table 4: Sustainable Materials

4.2.5 Local and Sustainable Food

The team learned through data analysis about WPI's efforts to purchase and serve local food sustainably. These on-campus efforts pertain to the Local and Sustainable Food principle.

WPI's dining services are managed by Chartwells Dining, a business that promotes sustainable practices (Chartwells). As of 2012, Chartwells used 27% of the food budget on local sources within 150 miles of campus (Campus Sustainability Report, 2012). Chartwells attempts to be cautious when it comes to purchasing food. Chartwells purchases cage-free eggs, sustainable seafood from Monterey Bay Aquarium Seafood Watch, antibiotic and hormone free food, and fair trade coffee (Worcester Polytechnic Institute). As part of Chartwells's dining policy, a vegan main dish with two sides is served twice a day every day (Campus Sustainability Report, 2012). Additionally, some herbs from the East Hall rooftop garden and the Higgins House garden are used for cooking in the dining hall (Tomaszewski, 2011). These efforts allow WPI community members to eat diets high in local food purchased locally and sometimes sustainably.

Despite Chartwells's efforts to purchase locally, the survey data shows that the WPI community wants more. When having to choose on a scale from strongly disagree to strongly agree, 57% of survey takers were neutral on the statement "Chartwells make efforts to purchase food from local sources." Only 29% of the survey takers agreed or strongly agreed with that statement. See Appendix M for more survey statistics. WPI can increase efforts to purchase more local food and even grow local food and work towards achieving the CITs for the Local and Sustainable Food principle. For more information about the CITs, refer to Appendix A.

Local and Sustainable Food Recommendations

Chartwells is certainly making efforts to commit to sustainability, but their efforts can potentially be improved and expanded with suggestions from the WPI community. Using survey suggestions from the WPI community, the team developed recommendations for WPI to further current efforts. These recommendations are listed in Table 5 with their supporting evidence of why the team believes WPI should follow the recommendations as well as how WPI should go about implementing the recommendations.

A student run garden is our most suggested recommendation because of it both has student support and sets an example for students and the community. This suggestion would be the most visible and is one that has been accomplished at other universities. Student run gardens have been implemented at many other universities including University of Massachusetts Amherst, and WPI can learn from such examples. At UMass Amherst, they grow 1000 pounds of produce a year on a quarter acre plot (University of Massachusetts Amherst). Given limited space in Worcester, WPI could also consider vertical farming which would drastically reduce land requirements. These gardens can contribute to the increasing use of locally grown food.

We suggest an IQP team be formed to investigate how and where this garden could be built. Given the limited size of campus, this suggestion would clearly take careful investigation and deliberation. The IQP team should work with the President's Task Force on Sustainability to determine the feasibility of this project. With these suggestions, WPI can improve its efforts in supporting and using more locally grown food.

Suggestions	Support	Implementation
1. Investigate creating a student run garden. 2. Offer more locally grown food from Massachusetts Community Supported Agriculture (Mass CSA) Farms. 3. Host more farmers markets on campus.	1. A student run garden was recommended by the WPI community during data collection. This idea would be most visible on campus and has been done at other colleges before. 2. The WPI community expressed desire for more locally grown food. 3. Past farmers markets are not frequent enough and are not advertised enough to the WPI community.	1. Use an IQP to investigate the plausibility and process of creating a student run garden. 2. WPI needs to first invest in Mass CSA farms in order to receive locally grown food. 3. Contact more farmers and more frequently. Plan to host more farmers markets more often.

Table 5: Local and Sustainable Food

4.2.6 Sustainable Water

The team identified and extracted all data relating to the Sustainable Water principle during data analysis. WPI has made efforts to reduce water usage, increase water efficiency, and storm water runoff.

One focus of WPI's water conservation lies in the campus buildings, especially on WPI's residential properties. WPI's main consumption of water occurs in WPI's on-campus housing with 54% of water and sewage use occurring on WPI's residential properties. With this, water efficiency has been a focus in the newly constructed residence halls. Dual-flush toilets and low-flow faucets reduce the water usage of East Hall by approximately 31% (Campus Sustainability Report, 2010). The new residence hall, which is currently under construction, also focuses on water efficiency with similar features to those of East Hall. In existing residence halls, all laundry facilities house high efficiency washing machines. These were also mentioned in the survey under the free response question asking what WPI does well. However aside from these efforts, there are no other policies in place for water efficiency or reduction of use in the existing residence halls according to WPI's draft Phase One report on sustainability.

Conversely, residential properties are not WPI's only focus for water efficiency and reduction. Every building on campus is individually metered for water usage. Water-saving changes have been around campus with the installation of dual-flush toilets in Goddard Hall and the planting of native plants well adapted to Worcester's precipitation patterns and thus do not require extra watering. Two buildings on campus have also been designed to address storm water runoff. The green roof atop East Hall reduces runoff by an estimated 50%. The new sports and recreation center also boasts an impressive storm water management system. Storm water is collected from the roof of the recreation center and is stored in two 2,500 gallon storage tanks

beneath WPI's quadrangle. This water is then utilized in the recreations HVAC cooling system which is estimated to save approximately 800,000 gallons of freshwater a year (Campus Sustainability Report, 2012).

Some of these efforts have been noticed by the WPI community. Survey takers listed the green bathrooms as something WPI does well and some also mentioned the green roof on East Hall. These can be seen in Appendix N. Of the surveyed community, 64% answered they had prior knowledge of the green roof on East Hall. However, when asked if they had prior knowledge of the storm water collection system on the recreation center, 75% of survey takers responded they did not.

Responses to the survey also brought attention to WPI's efforts to educate the campus community on sustainability. In addition to the more concrete physical efforts to improve water efficiency on campus, WPI has featured several water focused IQP and MQP's. In these projects, students have focused both on WPI and on other communities across the world with topics ranging from the development of rain gardens to providing clean drinking water to redirecting storm water runoff.

The campus community believes WPI can use our freshwater resources more sustainably. When asked by our survey if they thought it was plausible for WPI to make efforts toward achieving the Sustainable Water principle, 83% of survey takers responded that they thought it was either plausible or very plausible for WPI to do so. This was the highest ranked principle when compared to responses of preference to the other principles. The community preference on the individual principles can be seen in Appendix L. When asked to rank suggestions for WPI provided by our IQP team on a continuum of preference, 79% of survey takers marked preferred or most preferred for the suggestion for the use of reclaimed water for watering of the campus

grounds and 77% marked preferred or most preferred for the suggestion of implementing more green rooftops like that of East Hall. This data can be seen in figures 9 and 10 respectively.

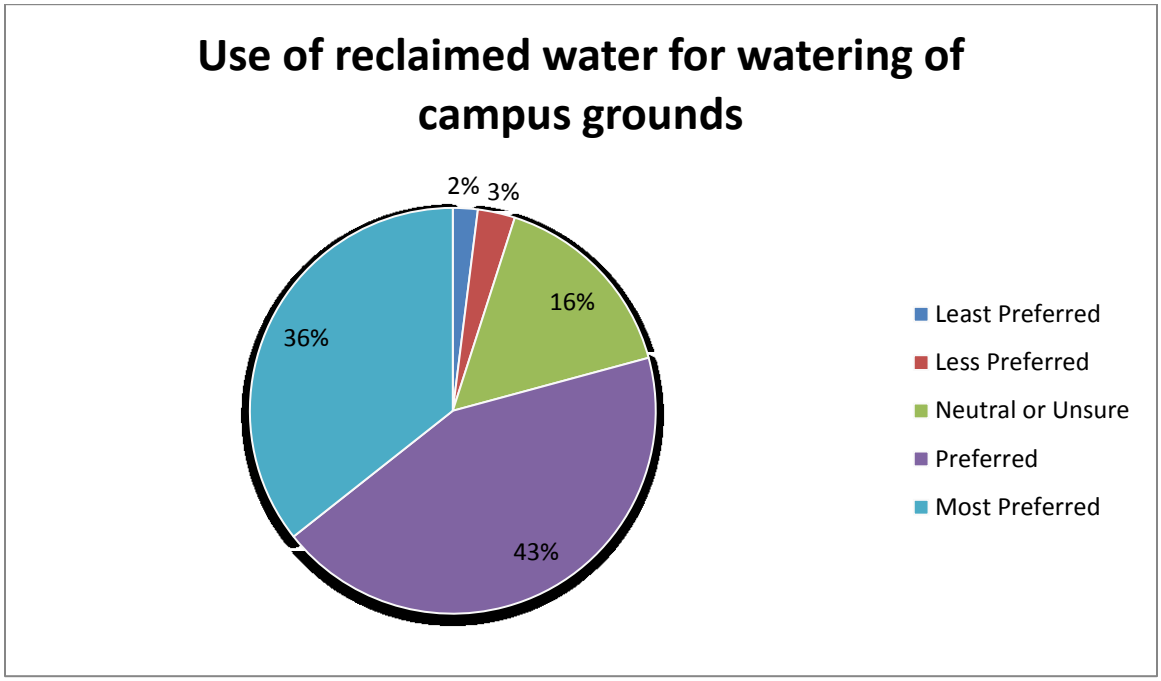

Figure 9: Community opinion on the use of reclaimed water for watering

WPI's new buildings can serve as examples of their commitment to sustainability. Utilizing water conservation and recycling systems in these buildings WPI has begun reducing their water usage. Given the optimism and enthusiasm of the WPI community, WPI should consider extending water conservation and recycling technologies to older buildings to further improve the campus and strive to continually design and build new structures that are more sustainable than the last.

Sustainable Water Recommendations

After analyzing our findings, the team developed recommendations to assist WPI in making progress in the Sustainable Water principle. Table 6 presents our recommendations for improvement in the area of the Sustainable Water principle as well as some evidence of why we

believe those recommendations would be successful and how we believe they should be completed.

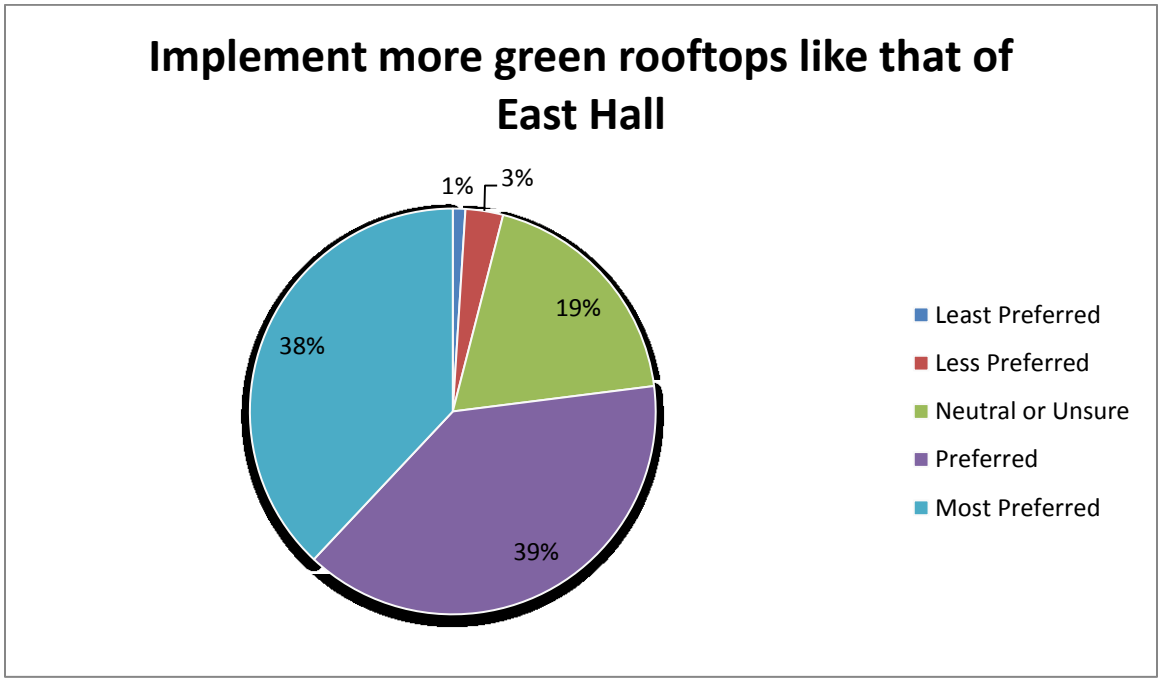

Figure 10: Community opinion on implementation of green rooftops

Our priority recommendation for Sustainable Water principle is the better regulation of its irrigation systems. This could be put into place quickly and have immediate impact in the reduction of water usage. Upon surveying the WPI community, several survey takers noted examples of poor regulation of the irrigation for the question asking their opinion on what could be changed, added, or improved in relation to WPI's sustainability efforts. In order for this change to occur, the system or schedule which currently controls the irrigation of the grounds would need to be investigated and amended. It is recommended a survey be taken of each area of irrigation to ascertain areas of excessive irrigation and over-spray. It was also mentioned in the survey and is recommended that the system be adjusted such that the irrigation does not turn on during or after a rain. The Department of Facilities would oversee these changes.

Recommendations	Support	Implementation
1. Better regulate irrigation. 2. Install grey water collection systems in new buildings. 3. Investigate the installation of storm water collection systems. 4. Install bioswale and/or rain gardens for storm water management.	1. Sprinkler regulation was mentioned several times in survey in relation to what WPI could add, change, or improve. Wasteful watering was mentioned in survey in relation to what WPI could add, change, or improve with the focus on excessive watering or inappropriate watering such as sprinkler pointing in wrong directions or watering after it has already rained. 2. GPS project focused on this during A and B term Reclaimed water used successfully for irrigation at several universities across the US: Georgia Southern University to California State Polytechnic University- Pomona 79% of surveyed community supports the use of reclaimed water for campus irrigation 3. Currently implemented on Sports and Recreation Center roof. Successfully implemented at several universities including Dartmouth University and the University of Pennsylvania 4. Rain gardens and bioswale used by several colleges and universities across the United States. Refer to The Princeton Review's Guide to 322 Green Colleges for several examples.	1. IQP team for investigation into current control system of irrigation. Team would also survey irrigated areas to determine locations of excessive watering and inefficient watering. Facilities would use recommendations from IQP team to adjust irrigation system appropriately 2. PTFS and/or Sustainability coordinator would work with contractors and/or construction managers to integrate collection systems into new building designs. 3. PTFS and/or Sustainability coordinator would work with contractors and/or construction managers to integrate collection systems into new building designs. 4. IQP team to determine areas for implementation and appropriate selection of storm water management per area. PTFS or Sustainability Coordinator for organization Student Green Team for implementation

Table 6: Sustainable Water

4.2.7 Land Use and Wildlife

The One Planet Living principle of Land Use and Wildlife was designed to halt the loss of biodiversity in the local community. One Planet Living's Common International Target for this principle explains that this can be achieved by preserving local, natural habitats and expanding the areas set aside for wildlife. The goals of this principle are to ensure that the sourcing of materials does not contribute to any habitat destruction, to regulate land and roof areas to maximize biodiversity, and to involve the community in this process so that residents can contribute in a positive manner.

To date, WPI has implemented several practices relevant to this principle which fulfill some of its goals. The institution has incorporated native plants as part of the campus' greenery, including a variety of perennial flowers. These resilient flowers reduce the amount of pesticides and decrease the need for irrigation; planting them is a simple way to avoid habitat destruction while simultaneously maximizing biodiversity **(***The Plan for Sustainability at WPI: Building Leadership in Sustainability Through Theory and Practice***)**. Flourishing campus grounds are sustained through fertilization, irrigation, and pruning techniques. Automated irrigation systems increase water efficiency by watering during times when evaporation is minimal, thus reducing overall water usage. These systems are periodically audited to ensure they are running at maximum efficiency. Additionally, WPI uses green products for pest control and organically maintains 87% of campus grounds. For instance, most weeding is performed by hand to minimize damage to surrounding plants and limited herbicide applications are only applied via a licensed applicator (Campus Sustainability Report, 2012). These are all measures that WPI can continue to administer when expanding its land use and preserving its local wildlife.

In speaking with John Orr, he acknowledged that it is important to remember that people are not the only ones living on the planet, and sustainability efforts must take into account concerns for the rest of the biosphere (Orr, 2012). Our team can conclude that Professor Orr is not alone in this manner of thinking, as is conveyed through the Campus Sustainability Reports. For instance, as of fiscal year 2010 native plants have been included with the campus greenery, making irrigation less necessary and pest control less intensive (Campus Sustainability Report, 2010). Due to the fact that WPI is a small college campus rather than a large community, there is not a great deal of effort placed on advertising sustainable land use and protection of wildlife.

Our team found that the majority of faculty and students showed support for this principle. Of the 421 individuals that took our survey, 56% of respondents either Preferred or Most Preferred the implementation of Land Use and Wildlife. However, only 14% did not prefer this principle's implementation, as 29% were neutral (Appendix L). These statistics show that, even though the majority was supportive, there were many who were either apathetic or unaware of what this principle could mean for WPI. To eliminate the neutral stance, WPI must better engage and educate the community with regards to efforts that promote Land Use and Wildlife.

Land Use and Wildlife Recommendations

We compiled several recommendations for implementing this principle after receiving feedback from our survey and interviews, as well as through findings from our document analysis. A table of these recommendations for improvement, the reasoning for each suggestion, and how each can be implemented is below. The suggestion most highly recommended for WPI is to plant more native trees. In speaking with the Student Green Team, we learned that the invasion of the Asian Longhorn Beetle in the Worcester area has claimed thousands of trees (Student Green Team, 2012). In order to halt this loss of biodiversity, the community must act

quickly to replenish local tree life. The solution of planting more native trees not only helps to preserve natural habitats, but it also is a means by which the community can contribute and have a positive impact on the environment.

To implement the suggestion of planting native trees, large student groups on campus, facilities, and the President's Task Force on Sustainability should collaborate. These new trees would be more resilient to the beetle and include species such as ashes and poplar. As this is a time-sensitive issue, future IQP groups could also be engaged in the planting to increase manpower behind the effort. Reaching out to other colleges in the Worcester area, such as Clark and Holy Cross, would allow WPI to maximize involvement and minimize the time and cost of planting.

Labeling of campus trees and plants is also recommended to involve and educate the WPI community. Small fact cards could be created to give the common and scientific names of different species that are grown on campus grounds. To further expand this effort, a portion of the WPI website could be dedicated to identifying and taking inventory of both flora and fauna of the campus, as well as determining if they are protected or locally significant. Finally, the suggestion of gardening as part of the physical education curriculum would allow students to be involved in such physical exertions as lifting and digging. These additional suggestions, in combination with the first, will help WPI on its way to adopting the principle of Land Use and Wildlife. In any case, this principle is the best visual representation WPI can give of how "green" they are as a campus and therefore an important step in achieving a sustainable community.

Recommendations	Support	Implementation
1. Plant more native trees around campus and the surrounding community. 2. Label the campus' trees and plants and create a website cataloging trees and plants. 3. Offer Physical Education credit for gardening and planting.	1. Halt loss of biodiversity (Invasion of the Asian Longhorn Beetle claimed thousands of local trees) 2. Would educate and spread awareness to the WPI community 3. Would involve the WPI community in environmental preservation. Also fulfills Health and Happiness principle (physical labor such as lifting and digging) 56% either Preferred or Most Preferred the adoption of this principle (Appendix L)	1 Plant more resilient tree species such as ashes and poplar. Involve large student groups on campus, facilities, the President's Task Force on Sustainability, future IQP groups, and other colleges in the Worcester consortium 2 Create small fact cards to give the common and scientific names; Website would identify and inventory flora and fauna on campus, determining if any are protected or locally significant. Involve Student Green Team, facilities, and future IQP group 3 Future IQP group, Student Green Team, and Task Force would design curriculum

Table 7: Land Use and Wildlife

The suggestion to plant more native trees is most highly recommended for WPI. In speaking with the Student Green Team, we learned that the invasion of the Asian Longhorn Beetle in the Worcester area has claimed thousands of trees (Student Green Team, 2012). In order to halt this loss of biodiversity, the community must act quickly to replenish local tree life. The solution of planting more native trees not only helps to preserve natural habitats, but it also is a means by which the community can contribute and have a positive impact on the environment.

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"green" they are as a campus and therefore an important step in achieving a sustainable community.

4.2.8 Culture and Community

The principle of Culture and Community was designed to prevent the loss of local identity and promote knowledge in general. One Planet Living's Common International Target for this principle explains that this can be achieved by uniting local culture and heritage through community involvement, as well as supporting community projects. The WPI community can be defined both internally as students, faculty and staff and externally as the Worcester area. The goals of this principle are to provide financial support to the community, to encourage charitable giving, to increase community engagement, and to ensure community awareness. This section is broken into several sub-sections. Each sub-section helps address the many aspects that were discussed during the interview process and uncovered during document analysis and through survey responses. It should also be noted that 66% of survey respondents either Preferred or Most Preferred the implementation of this principle (See Appendix L).

WPI and the Local Community

If WPI is to adopt this principle, it must first define the parameters of what and who is included in the WPI community. Christine Girouard's Community Engagement working group is specifically focused on finding the most effective method of involving the community in sustainability efforts. She explained to us that her group defined the community both internally, as WPI, and externally, as the city of Worcester and the state of Massachusetts (Girouard, 2012). With this definition, WPI can then determine how best to interact with others in the surrounding area.

When speaking of the WPI community, it is important to not make WPI out to be a lone island. On this note, Ms. Girouard feels that a conversation needs to occur that revolves around WPI's relationship with the surrounding community and what the institution does to reach out to and help them (Girouard, 2012). When we interviewed the Student Green Team's interim president, Chris Sontag, we learned that he first became involved with sustainability efforts in middle school and he continued to be involved when he discovered the Student Green Team's booth at the activities fair. (Sontag, 2012) Our IQP group can conclude from this that one easy way to engage the Worcester community is to educate local middle schools and high schools about sustainability. At a young age, children are more open to and accepting of the concept of sustainable behavior (Brenner, 2012).

Community collaboration has already begun. John Orr spoke to us of the Tri-Campus Initiative, also known as SynergE that engages WPI, Holy Cross, and Clark and is run with the assistance of National Grid's sponsorship and GreenerU's expertise. He told us of the two projects that have been commissioned at WPI: sub-metering to determine electricity usage of each building and retro-commissioning to improve existing buildings (Orr, 2012). The topic of SynergE Worcester also surfaced in our interview with Elizabeth Tomaszewski. Unfortunately, she told us, only a handful of WPI's community members participate in the meetings regularly. We also learned from her that in addition to projects unique to WPI, SynergE will have projects that involve all three of these campuses in the Worcester community (Tomaszewski, 2012). With three of the Worcester consortium campuses on the same page, it will only be a matter of time before the rest of the community is engaged with sustainability as well.

One instance of how WPI is engaging and supporting the local community is through the construction of the institution's newest building, the Sports and Recreation Center. Many local

contractors contributed to its development, about a third of expenditures were to Worcester County subcontractors, and the city of Worcester profited upwards of $500,000 from the project's building permits and other fees (Worcester Polytechnic Institute, 2012f). Through these actions WPI showed that it values the surrounding community by involving people in the Worcester area to partake in a huge step in its sustainability efforts: building a greener building.

Groups on Campus

One of the ways students become knowledgeable about sustainability efforts is through involvement with organizations on campus. Elizabeth Tomaszewski explained that the Eco-Representative program began in 2010 and is made up of staff and students. However, Ms. Tomaszewski lamented that the group was neglected and only recently resurrected through the efforts of the college's GreenerU consultant (Tomaszewski, 2012). Through our interview with Christine Girouard, we learned that she is an Eco-Rep and that both staff and student Eco-Reps work on projects to engage the community (Girouard, 2012). Having a group of staff and students working together is a great way to involve two bodies of people on campus in a way that can unify them. If the different bodies of people on campus are unified, then the campus can more easily more forward with sustainability initiatives. This group has gained more presence on campus, as our survey results showed it to be the fourth most known group on campus.

According to our survey responses, depicted in Figure 11, the most well-known sustainability-related group on campus is the Student Green Team. The Student Green Team as it is today was formed in September of 2009 (Worcester Polytechnic Institute, 2010). Chris Sontag, current Student Green Team interim president, was able to give us a better idea of what they do on campus. According to Sontag, the Green Team tries to raise student awareness through events like the A-term sustainability pledge held near the fountain in the center of

campus (Sontag, 2012). Our IQP team participated in another one of their events, the second annual Waste Audit, held on the quadrangle. Many students, especially freshmen, must pass by the quad on their way to and from class. This made the event an excellent way to increase awareness and involvement. Although all of the people who were involved in the Waste Audit had signed up in advance, there were still a few individuals who curiously paused to watch. The Student Green Team has shown their large aspirations through the various events they hold, but they are still a small body of people. In order for the promising ideas of the dedicated members of the Student Green Team to come to fruition, they have to work to increase involvement from and awareness in students.

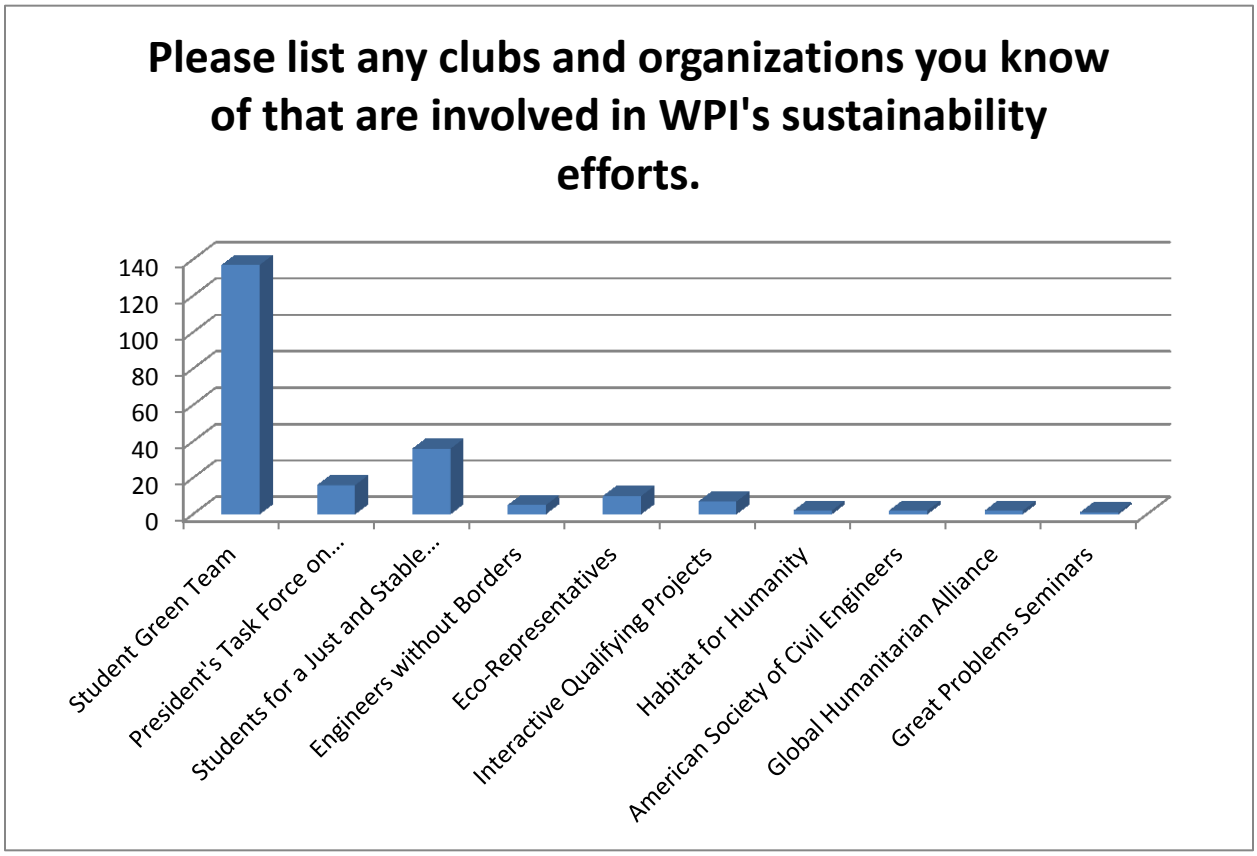

Figure 11: Number of Times a Sustainability-Related Group on Campus Was Identified

The figure above illustrated that there are several other student groups on campus who are not as well-known as the Student Green Team, but who have also shown up on student or

faculty radar. One group is Students for a Just and Stable Future, which is a more politically-inclined group that focuses on environmental justice and social activism (Pollin, 2012). Another is Engineers Without Borders, which partners with communities like WPI to improve the quality of life for individuals. The Global Humanitarian Alliance (GHA) at WPI works to raise awareness of topics such as poverty around the world. One event that GHA held, Week of Inspiration, Service and Hope, showcased several organizations to enlighten the community about local culture (Campus Sustainability Report, 2012). All of these clubs and groups, although not as publicized as the Student Green Team, still play an important role in involving and educating the WPI community.

Community Engagement and Awareness

Through interviews and survey responses, our team has deduced that many member of the WPI campus community lack knowledge of sustainability efforts and sustainable behaviors, or are simply apathetic to them. Only 45% of survey respondents either Agreed or Strongly Agreed that they were familiar with WPI's sustainability efforts (See Appendix M). Although the majority was in support of implementing this principle, 25% answered Neutral, or apathetic (See Appendix L). The deficiency of engagement from the WPI campus community in sustainability efforts was a concern that arose in every interview we conducted. Elizabeth Tomaszewski said that those who have the passion and motivation to participate are also generally busy because they are already very involved (Tomaszewski, 2012). Christine Girouard acknowledged the obstacle of apathetic students who throw an item in the trash if the recycling bin is across the room. Another excellent point she made was that without the education piece, students may think they are being sustainable by recycling a plastic container, yet the container is contaminated with food and cannot be recycled (Girouard, 2012). Our IQP team realized how

astute Ms. Girouard's comments were during our involvement with the Waste Audit, where we found numerous articles that were either misplaced in recycling or trash.

The poor engagement of the WPI community is certainly not for lack of trying. Elizabeth Tomaszewski explained that the Task Force had tried to reach out to students through the forum of Resident Advisors and Community Advisors, but they did not receive any input (Tomaszewski, 2012). When we spoke with Ryan Pollin, he told us that he redesigned the sustainability website, but to his knowledge no one has really gone on it. He also spoke of how a survey on sustainability was sent out, but it only got a couple dozen responses (Pollin, 2012). Ms. Tomaszewski's and Professor Orr's interviews also brought up the poor number of responses to this survey. The team suspects that we received a far greater number of survey responses (421) because our email came across as less official and the link to the survey was easier to locate. Mr. Pollin agreed with us, saying that going more low-tech like student-run clubs may be beneficial to the Task Force's efforts. Although the efforts of the PTFS are many, these efforts may need modification to better appeal to the student body.

Another matter of worry for the Task Force is the negative or indifferent attitude of many students towards sustainability efforts. Elizabeth Tomaszewski informed us that she has encountered students who have expressed disinterest or apathy in response to sustainability and the environment. She also told us that there are only six students involved with the PTFS (Tomaszewski, 2012). Ryan Pollin informed the team about the SharePoint website that was created for student input on sustainability, but only 3 other people ever used it (Pollin, 2012). The small number of students on the Task Force and the even smaller number of students who contributed to Pollin's SharePoint website make it difficult for the Task Force to claim that they have student input for their sustainability efforts. John Orr expressed that the lack of community

involvement at the two open meetings the Task Force held was disappointing (Orr, 2012). This was yet another opportunity that the Task Force and four working groups gave students to voice their opinions. Our IQP team sees this obstacle to also be one our project faces in trying to bring the principle of Culture and Community, as well as the other nine principles, to WPI.

In order to open and expand the minds of future generations, WPI must first change the mentality of its current ones. Christine Girouard said that "the students are the majority of the campus. To create a culture change-that not only takes policy, faculty, and staff, but that takes students ownership too" (Girouard, 2012). Through this statement she acknowledges that the true moving force of the campus is the student body and to inspire the campus to change, first the students must be inspired. John Orr spoke of the four groups' hope that "every student leaves WPI with some sort of understanding of the impact of sustainability and will carry [it] with [them]" (Orr, 2012). He, too, has shown his understanding of the importance in engaging the students. What's more students must be made aware that their engagement in sustainability efforts is not only for the benefit of the campus, but for the benefit of the planet. If this message can be made clear to all the students that enter and leave the WPI community, then there is hope for the implementation of this principle.

Communication

WPI's sustainability efforts truly began when the President's Task Force on Sustainability was founded in 2007. An active member of the Task Force, Elizabeth Tomaszewski informed us that she is still searching for a way to integrate WPI's activities and communication. She aims to have the staff, faculty, and students all share a single method of communication and a common pool of sustainability resources. Currently she acts as a liaison between the students and the Task Force through her involvement with the Student Green Team.

However, Elizabeth Tomaszewski only works part time on sustainability and did not have the time this year to spend "an excessive 40 hours" to complete the AASHE STARS survey for the Sierra Club and Princeton Review. Her recommendation is for the institution to hire a full time employee to carry out such sustainability efforts (Tomaszewski, 2012). Of the several people we interviewed, she was not the only one who had come to this conclusion.

As head of the Community Engagement working group, Christine Girouard informed us of the lack of central communication and the reoccurring issue of trying to identify the sustainability efforts of different departments on campus (Girouard, 2012). John Orr expressed a similar sentiment. Professor Orr conveyed the need for WPI to have more organization when collecting data pertaining to sustainability efforts (Orr, 2012). Ryan Pollin was also recently involved with the Task Forced and responsible for writing WPI's 2012 Campus Sustainability Report. He, too, commented on this lack of coordination between departments on campus (Pollin, 2012). Looking back at each of their interviews, Mr. Pollin, Ms. Girouard and Professor Orr all recognized the need for an employee or office whose sole responsibility would be to collaborate and progress WPI's sustainability efforts (Pollin, 2012; Girouard, 2012; Orr, 2012). This would involve outreach as well as providing education to the community on these efforts, both on the academics side and the operations side. Since this issue is widely recognized among those who are directly involved with WPI's sustainability efforts, we can conclude that is a rather important one that must be resolved if the Task Force and the two phase campus sustainability plan is ever to succeed.

Academics: Student Projects & Courses

With a sustainability office or a sustainability coordinator in place, there could finally be synchronization between sustainability-themed projects and related research. It is important to

be aware of how a community operates in order to elicit change. Elizabeth Tomaszewski informed us that student IQP and MQP efforts are how many things on campus get started. These junior and senior projects offer the opportunity to create systemic changes at WPI and in Worcester. Some past IQPs and MQPs have facilitated tray-less dining, composting food and the implementation of recycling bins in every campus building (Tomaszewski, 2012). These changes came about through student projects and demonstrate the power behind the voice of the student body.

Although the projects mentioned above directly impacted WPI, many MQPs and IQPs are often far-reaching. As of fiscal year 2012, WPI's Global Perspective Program for IQPs and MQPs offered projects in 32 communities worldwide. Moreover, in this same fiscal year, all five projects nominated for WPI's President's Award were sustainability-focused (Campus Sustainability Report, 2012). The number of project sites shows WPI's commitment to give back to the global community. Students must understand how to interact with communities that are unlike their own, otherwise the people of the world will never truly live as one planet. An aspect that WPI has conceptualized well is acknowledging student strides in the field of sustainability through the President's Award (Campus Sustainability Report, 2012). By encouraging and rewarding this style of behavior and thinking, WPI is one step closer to having a campus that conducts itself in a similar manner.

On another academic note, over the past three years WPI has introduced an additional 13 sustainability-related and 20 sustainability-focused courses to the curriculum. In the fall of 2006 WPI introduced the Great Problems Seminars (Feed the World, Heal the World, Power the World and Grand Challenges) to give first year students the opportunity to preview WPI's unique project experience (Campus Sustainability Report, 2012). WPI also introduces students to

sustainable living as soon as they enter the institution by offering a sustainability session during new student orientation. The flaws of this session are that it only focuses on the academics aspect instead of sustainability as a whole and not all students are aware of it because there is resistance to making such sessions mandatory. Springing from this idea, Ms. Tomaszewski said that there was discussion about having newly hired staff and faculty receive an orientation on sustainability (Tomaszewski 2012). Our IQP team can deduct that through these projects and courses, WPI has brought a good deal of sustainability education to the campus.

Culture and Community Recommendations

Despite current efforts, WPI still has room for improvement as the campus progresses forward to sustainability. Table 8 below details recommendations for improvement, the reasoning behind each and how each can be implemented.

The most recommended suggestion gathered from both interviewees and the survey respondents was to increase the visibility of efforts as well as the awareness and engagement of the community. Few students contribute to WPI's current sustainability efforts and many are unaware of these efforts altogether. Worse still, these individuals do not understand the importance of their potential contributions. This suggestion must be given highest priority because WPI cannot expect the Worcester community to fully embrace sustainability if its internal community does not.

There are several means by which this first suggestion could be implemented. WPI could look to large student-run organizations, such as Student Government Association (SGA) and Greek organizations, to co-sponsor sustainability events and chalk sustainability facts around campus. Chalking campus sidewalks is an inexpensive and simple way to spread knowledge to the bustling campus community. More large sustainability-themed events like Recyclemania

would help raise awareness and engagement. Such an event might be a Residence Hall energy competition where each residential building competes to lower energy usage. The Student Green Team, Residential Services, and other groups on campus could be major contributors to these events. Sustainability efforts could also be added to WPI publications, such as The Towers newspaper. This newspaper is distributed across campus and could greatly help to increase visibility and awareness. Overall, this suggestion is meant to bring sustainability to the forefront of student, faculty, and staff minds. The suggestion of a Sustainability Coordinator position and/or a Sustainability Office, discussed in more detail in section 4.3.2, would be beneficial in ensuring the mentioned implementation methods do not become unorganized, misdirected, and fall apart.

Recommendations	Support	Implementation
1. Increase visibility, awareness, and engagement in regards to sustainability efforts **2.** Spread sustainability education into Worcester schools	1. Few students contribute sustainability efforts. Many are unaware of these efforts. Some do not understand the importance of their potential contributions. 2. Charitable giving of time and knowledge; Would help instill a sense of responsibility and a sustainable mindset at a young age 66% either Preferred or Most Preferred the adoption of this principle (Appendix L)	1. Invite large student-run groups (ex: SGA, SocComm, Greek organizations) to co-sponsor sustainability events and chalk sustainability facts on campus. Residence Hall energy competition to help raise awareness and engagement (Involve Student Green Team, Residential Services); Publish sustainability efforts in the campus newspaper, The Towers, to increase visibility. Sustainability Coordinator and/or Sustainability Office could work with President's Task Force on Sustainability. 2. WPI Student Green Team could partner with a future IQP group to encourage recycling and establish Middle and High School Student Green Teams

Table 8: Culture and Community

4.2.9 Equity and Local Economy

The One Planet Living principle Equity and Local Economy embodies assessing the work environment's ethical, social, and environmental aspects. This principle seeks to address the key themes of green jobs, equity and inclusiveness, participation and fair trade goods. This principle envisions an inclusive community with participation from the community members. This principle also specifically examines suppliers and measure if they protect the environment, protect their employees, offer fair wages, hire without discrimination, prevent child labor, and considers employee's health.

Through data collection, our team found that WPI already meets aspects of this principle. WPI adheres to certain ethical, social, and environmental standards. WPI's Division of Human Resources ensures that all employees and applicants have equal opportunities. Human Resources provide services to help new employees transition into the community, as well as various resources for all employees. These resources include, but are not limited to, Employees Assistance Program for consultations and assessments, employee discounts from local vendors, paid holidays and two personal days, Multicultural Resource guide for networking, retirement resources, Web Time Entry to record hours accurately, Wellness Program for health, and a handbook for maternity, paternity, and adoption issues. With these polices, the institution evidently has already fulfilled the portion of this principle pertaining to its responsibility to its own employees.

Our team found that WPI teaches 70 courses which are sustainability focused or sustainability related. These courses already address the majority of the themes in this principle. In addition, WPI already offers seminars, lectures and teach-ins related to the key theme of equity and inclusiveness. In addition, WPI purchased East Hall furniture from

companies with sustainable production processes and environmental friendly factories. WPI's dedication to civic duty and sustainability curricula already offers students a principled education. Students' enthusiasm for sustainability will encourage many to participate in student organizations which touch the community.

During data collection, our team found information regarding Equity and Local Economy of the institution. There were not many suggestions or feedback for this particular principle from the survey. However, through data collection, it's apparent that WPI already partially fulfills this principle. WPI's Division of Human Resources provides various resources for all employees, guaranteeing equal opportunities for all. Also, WPI student clubs and organizations promote an inclusive community and nurture a culture that encourages civic duty. Steps toward the adoption of this principle have already begun however there is still more that WPI should do to address the Equity and Local Economy Principal.

Equity and Local Economy Recommendations

Our team found that WPI is very close to achieving the Equity and Local Economy principle through their current efforts. The ream made recommendations using data collected and analyzed for WPI to further their efforts. The recommendations with their supportive evidence and method of implementation are displayed in Table 9.

Of the suggestions below, coordinating with existing student organizations to further key themes of this principle is our most highly suggested recommendation for WPI. If the institution encourages student organizations to explicitly incorporate the principle in their focus and encourages student organizations to collaborate to influence the community collectively. WPI has already dedicated itself to civic duty and inclusive community however we feel that they could benefit from the adopting the OPL principle of Equity and Local Economy. Through this

principle, the institution will achieve an inclusive community that is a responsible participant in the local economy.

The Student Government Association or Student Activities Office (SAO) should inform the executive officers of clubs and organizations how to incorporate the key themes of green jobs, equity and inclusiveness, participation and fair trade goods. This would allow student organizations to integrate education into their programs and collaborate with each other to influence the student body and local residents. Together, these student organizations positively impact the direction of the community. The foundation for this principle is present in WPI's operations, but implementing this, and the other suggestions, could bring benefits not only to the institution, but also in the community in which it resides.

Suggestions	Support	Implementation
1. Coordinate with existing student organizations to further key themes of this principle. 2. Establish process to assess suppliers' equity practices.	1. Student organizations are engaged in both the student body and the local community. They are knowledgeable and interested in environmentalism, social justice, and sustainability. They can educate others about applicable One Plant Principles. The student organizations can help achieve an inclusive community 2. A set of standards can be developed to assess suppliers' equity practices and choose best-fitting suppliers that practice sustainability and good ethics.	1. Ask SGA or SAO to provide information of environmentalism, social justice, and sustainability to clubs and organizations executive officers. Student clubs and organizations can educate their members of these subjects and encourage an inclusive community. 2. WPI can delegate a person or people who are responsible for purchasing materials to develop a set of standards to assess companies' processes and sources. WPI can seek to purchase products that meet U.S. Green Building Council approved programs.

Table 9: Equity and Local Economy

4.2.10 Health and Happiness

The last, but certainly not least important, of the ten OPL principles is Health and Happiness. The principle of Health and Happiness aims to enhance the lives of community members. This principle values the physical and mental well-being of individuals, deeming these characteristics important to a functioning society. This is accomplished by encouraging community members to lead active, social, and meaningful lives. One Planet Living's Common International Targets for this principle include the production of a plan that promotes both the health and the happiness of the local residents. Faculty and staff are asked to take the Gallup 12 survey which evaluates workplace environments. A minimum participation of 80% and an average score of 4.15 out of 5 are required for the project to meet the targets for this principle. The community should achieve work-life balance, have access to health information and screening, and be offered sport and social clubs and activities (see Appendix A for more information). Happiness is not an aspect that can be easily measured, yet it is absolutely essential if the other principles are to be adopted. Through the analysis of reports and documents, survey responses, and interviews, the team was able to evaluate the progress WPI has made towards this principle.

One way to gauge community happiness is to listen to what community members have to say. Students at WPI tend to be proactive and vocal about what they want. An instance of this appeared during our interactive presentation with the Student Green Team. A petition was being passed around the room that called for WPI to stop investing in fossil fuel companies, such as ExxonMobil. However, a conflicting party in the room who was against divesting stated that WPI should not pull away from such companies while there is not an alternative power company to invest in (Student Green Team, 2012). The students at WPI are both opinionated and passionate, so the institution must respect and acknowledge this to gain community support in its

efforts. The same topic of discussion arose during the interview with John Orr and his point was one that our team had yet to consider. He spoke of the importance for WPI not to appear two-faced by divesting in fossil fuels, but then still using them to travel across the globe for IQP and MQP projects (Orr, 2012). Members of the WPI community must be able to trust and rely on the institution and therefore the institution must be committed in its stance. A happy community is one that is listened to and able to trust in its authorities, as this allows residents to have a sense of pride and security.

WPI ensures the happiness of its community through both policy and action. Employees are offered a variety of programs such as Professional Development and Technology Training, to allow them to enhance and expand their skills (Worcester Polytechnic Institute). Students are provided course evaluation forms at the end of each term to assess the course, the teaching assistant, and the professor. These evaluations help to pinpoint areas for improvement as well as identify successful aspects that can be applied to future courses. Input is also gathered via online evaluations from employees, which help determine their level of satisfaction. In addition to WPI's academic function, 190 clubs and organizations are run by and open to these community members (Worcester Polytechnic Institute, 2012c). Understanding the community's concerns and addressing them is one way WPI is working towards the principle of Health and Happiness.

The institution has also worked to ensure the health of its community. The recently constructed Sports and Recreation Center is one example. This new campus building houses an assortment of workout equipment, an indoor track, full service locker rooms, athletic areas, and equipment training workshops to promote physical fitness (Worcester Polytechnic Institute, 2012e; Worcester Polytechnic Institute, 2012f). Wellness programs, including Weight Watchers and yoga classes, are present on campus (Worcester Polytechnic Institute, 2011). These and

other efforts have allowed individuals of the WPI to live healthier lifestyles, in turn promoting the principle of Health and Happiness.

Additionally, WPI provides a variety of services to its community through the Student Health Center. Their goals of preventative health care and the long term well-being of the campus community are met through counseling, men's and women's healthcare, immunization clinics and many other services. The twelve staff members that work there not only help to treat any illnesses that arise, but also educate the campus so that students can be informed in making good lifelong decisions (Worcester Polytechnic Institute, 2012d). A comprehensive health care service also allows for a happy community, as the individuals are made to feel cared about and taken after. Giving the community a sense of security is one of the easier ways to evoke happiness and it is an important factor in the adoption of this final principle.

Community service is an aspect that can promote both health and happiness simultaneously. When students, faculty, or staff give back to the surrounding community, they are often not only improving the Worcester environment, but the lives of those who live in it. In 2012 alone, the WPI community logged 20,000 hours of community service and raised $100,000 for community service agencies. A large annual event called Work on Worcester brings together groups and individuals to clean up the neglected parts of the city (Campus Sustainability Report, 2012). Helping less fortunate people can leave WPI community members with a sense of self-fulfillment that often comes from these acts. This is why WPI should both continue current community service efforts and also constantly look to expand them.

Health and Happiness Recommendations

After expanding our understanding of WPI's current efforts and the needs of the community, the team compiled a list of suggestions to help implement this principle. Table 10

below details recommendations for improvement, the reasoning behind each and how each can be implemented.

Although the dining areas already use trans-fat free cooling oil and offer healthy alternatives such as vegetarian entrées, the community is not yet satisfied (Campus Sustainability Report, 2012). The most highly recommended suggestion, additional healthy food options, was a common request among survey takers. This suggestion is given priority over the others because it will have a more immediate positive impact on the WPI community. The reasoning behind this suggestion is quite simple: when you eat better, you feel better. Therefore, offering a greater selection of health-conscious foods will boost students' immune systems and help with their overall health. Healthier students are less likely to miss classes or assignments and more likely to be alert and retain more information during lectures.

To implement this suggestion, the institution should reduce the amount of processed food served and provide more organic food options. This would require Chartwells to investigate which foods could be replaced with the most ease and the least cost. An IQP or GPS group could assist Chartwells in this investigation. Another end result that could be achieved by the IQP or GPS project could be increased community awareness of which diet selections are healthiest, perhaps by adding this information to the televisions located above each section of the buffet. Chartwells could also adopt "Meatless Mondays". This suggestion came directly from the community as a survey response and could be another end result of said project. Through these changes WPI can obtain a well-nourished community. In continuing to adopt the Health and Happiness principle, the additional suggestions should be considered as well.

Recommendations	Support	Implementation
1. Offer additional healthy food options. 2. Offer cooking classes. **3.** Offer more physical education classes that are enjoyable more frequently.	1. Common request among survey takers; will have immediate positive impact on the WPI community; boost students' immune systems and help with their overall health. 2. Would improve community health and health-related knowledge; Would make healthy lifestyle more accessible 3. Request of survey respondents; enjoyable and beneficial to the community's health; Could instill passion for a healthy lifestyle. 79% either Preferred or Most Preferred the adoption of this principle (Appendix L)	1. Reduce the amount of processed food served and provide more organic food options; Have "Meatless Mondays" (from survey); Increase awareness of healthiest options (ex: information on televisions above buffet areas) Chartwells can investigate which food options can be replaced with the most ease and the least cost. Chartwells can partner with a future IQP or GPS group 2. A GPS group could partner with SocComm to compile recipes and teach the class 3. Greek Organizations, SocComm, and other large student groups could take turns hosting classes like Zumba for the WPI community

Table 10: Health and Happiness

4.3 Broad Recommendations

After our investigation, the team devised the following broad recommendations to assist with WPI's sustainability efforts in general. These recommendations will also help with many of the principles both directly and indirectly. Each recommendation is briefly described below.

4.3.1 Adopt One Planet Living Principles

The largest most obvious recommendation is for WPI to adopt the One Planet Living principles as a framework for their sustainability plan. Our team found that the four focuses defined in the Phase One Draft report on WPI's sustainability efforts (operation of WPI's campus facilities; academic programs, both in teaching and scholarship; institutional policies and practices that impact sustainability; community engagement, both on and off campus) overlap with the focuses of many of the One Planet Living principles. This means WPI can simply integrate the OPL principles into their current plan alongside their current focuses.

WPI could merge the principles in two manners. The first would be to maintain the four current focuses as the overarching framework and to use the principles to achieve them. In other words, by focusing on and achieving the goals of the principles, WPI would also be working toward the achievement of the four focus areas. The second manner for merging the principles into WPI's current framework would be to use the four focus areas to achieve each individual principle. This means for each principle the four focus areas would be worked on with the concentration of that specific principle. By working in the four focus areas for each principle, the goals of the principles would be achieved. Either of these methods of integration could be used to fully implement the ten principles as a framework for WPI's campus sustainability plan.

4.3.2 Create a Sustainability Coordinator Position and/or Sustainability Office

After discussing the governance of WPI's current sustainability efforts with three chairs, one intern, and one student of the President's Task Force on Sustainability, it was determined that a paid position who's responsibility it is to organize and direct WPI's sustainability efforts needs to be created. Currently, all individuals involved with WPI's sustainability movement are volunteers. This means their attentions and efforts are divided and certain tasks do not receive the amount of time and attention needed for them to be completed efficiently and effectively. A Sustainability Coordinator or those in a Sustainability Office would ensure the efforts of WPI would be completed in a timely and effective manner. This office or coordinator could coordinate with other groups on campus to assist them in their individual efforts as well. All sustainability efforts would be centralized, focused, and more easily governed under the position of Sustainability Coordinator and/or the Sustainability Office.

4.3.3 Improve Upon LEED Rating Requirement

It is also recommended that WPI strive to improve its LEED rating with each new construction project, eventually earning LEED Platinum continually. The Sports and Recreation Center, when completed, is expected to receive a LEED rating of Silver. In accordance with this recommendation, the next new building would achieve LEED Gold and the next after, LEED Platinum. WPI can focus on specific credit libraries to assist with other principles such as the Materials and Resources library for the Sustainable materials principle and the Energy and Atmosphere library for the Zero Carbon principle. Doing this will assist with the goals of a majority of the principles and thus should be a general guideline for new construction on campus.

4.3.4 Interactive Qualifying Projects for One Planet Living Integration

Our final general recommendation is for an IQP team at either the Worcester Community Project Center or the proposed WPI Sustainability Project Center to focus on the implementation of the suggestions and recommendations detailed below for each principle. For maximum efficiency and minimization of time, it is recommended that one project a term be focused on one recommendation. To keep the project up-to-date and to keep BioRegional informed of our progress, we also recommend that one project a year, either during A or D term, telecommunicate with BioRegional to determine WPI's progress toward achieving the principles and develop a new integration plan. This will ensure continual progress toward the accomplishment of the recommendations and eventual achievement of the principles.

Chapter 5 Conclusions

After thorough examination and investigation of the One Planet Living principles and of WPI's current and intended sustainability efforts, it can be determined that the One Planet Living principles could act as a framework for WPI's sustainability plan. It is plausible for WPI to work toward certain goals from both sets of Common International Targets for each principle. In other words, because WPI is neither a fully functioning, independent community nor only a business or organization, it would be in WPI's best interest work with BioRegional to examine both sets of CITs and determine on a principle by principle basis which set of goals applies more to the campus and community. It is determined that because of WPI's unique position as a college, WPI may not be able to fully meet the goals of the sets of CITs however, WPI should use them as guideline and as their own ultimate goals for sustainability. This does not mean, however, that WPI cannot meet the CITs for certain principles. WPI is very close to meeting or has already met certain goals of the CITs. Though, WPI is much farther along in the progress of meeting the targets for certain principles than others. For example, due to WPI's culture and deep sense of history and tradition, the goals of the Culture and Community principle are almost completed whereas the buildings on campus are nowhere near the goal of net zero carbon for the Zero Carbon principle.

The WPI community also weighed in on the plausibility of the principles for WPI's sustainability efforts. The community was in general agreement of the adoption of the principles with an average combined percentage of 66.3% of plausibility. A very small percentage of the surveyed community indicated that they believed it was barely or not plausible for WPI to adopt the principles with an average disagreement of 11.5%. While there was a larger than desired percentage of neutral responses with an average of 22.1%, there was a surprisingly low

percentage of general disagreement. Based on this, it can be said that the surveyed community generally agreed that it would be plausible for WPI to make efforts to adopt the ten OPL principles.

The team also reached out to gain the support from those specifically involved in WPI's sustainability efforts. In meeting with their Interim President, holding an interactive presentation with them, and participating in the waste audit they hosted, the team got to know the key members and received positive feedback and support from them. The team also presented the One Planet Living principles and their Integration Plan to the President's Task Force on Sustainability. The committee members openly received our recommendation for the utilization of the One Planet Living principles as a framework for WPI's sustainability plan and recognized the similarity between the focuses of the principles and the focuses currently outlined in The Plan for Sustainability at WPI Phase One Report. The committee members were not opposed to the implementation of the principles into the Phase Two Report which will be produced during the spring semester of 2013 and asked the team members if we would be willing to work on the Phase Two committee to help this occur.

Overall, the proposal of our project was accepted and our integration plan was accepted by the President's Task Force on Sustainability. At the end of our project, it has be determined that efforts will be made to integrate the One Planet Living principles into the sustainability plan of Worcester Polytechnic Institute.

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Appendix A: Common International Targets

Community Specific

Contents

Introduction

The aim of the One Planet initiative is to create a future where it is easy, attractive and affordable for people to lead happy and healthy lives within a fair share of the earth's resources – what we call One Planet Living. The initiative uses 10 guiding principles as a framework to help our partners examine the sustainability challenges they face and develop appropriate solutions. These principles were developed as a result of lessons learned from BioRegional's work at the pioneering BedZED eco-village in south London.

As part of the One Planet Communities programme, BioRegional applies the 10 One Planet principles to support the development of flagship sustainable communities on every inhabited continent. These One Planet Communities are intended to be places where residents can live a One Planet lifestyle by 2020, should they choose to.

This document is aimed at both organisations starting out on the journey of joining the One Planet Communities network and as a reference document for existing members. The Common International Targets are supported by a set of detailed guidance notes and position papers, available from BioRegional, which cover the application of these targets in more detail.

Environmental drivers behind the One Planet initiative

A sustainable future will need to consider environmental, social and economic factors and the 10 One Planet principles and their associated Common International Targets have been developed in recognition of this. However, we subscribe to the view that society or the economy cannot exist long term outside of a healthy environment and consequently there are three overarching environmental drivers behind the One Planet initiative:

- sustainable ecological footprint;
- sustainable carbon footprint; and
- clean (non-polluting) activities.

Sustainable ecological footprint

Ecological footprinting measures our consumption of natural resources in global hectares of land and sea. Research tells us that our global footprint now exceeds the world's capacity to regenerate by about 50%[1]. If our demands on the planet continue at the same rate, by 2030 we will need the equivalent of two planets to maintain our lifestyles.

One Planet Communities make it easy, attractive and affordable for their residents to live within a fair share of the earth's resources which, according to current calculations, will be no more than 1.2gha per person by 2020[2].

The graph below shows the trajectory for the global ecological footprint if we continue to consume at current levels in comparison to a rapid reduction in footprint.

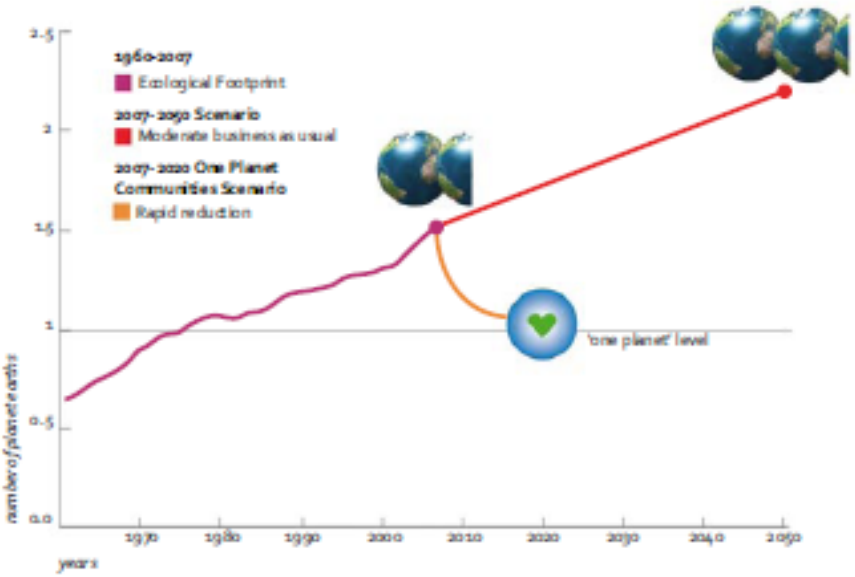

Figure 1: Ecological Footprint trajectory to one planet level (source: adapted from Global Footprint Network 2010).

This global trajectory, however, masks the fact that the goal of achieving a One Planet level of consumption will require trajectories which vary greatly depending on the country in which the community is based. For example, in the USA the average footprint is currently 8.0 gha per person whereas in China it is only 2.2 per person. Furthermore average national footprints themselves mask great differences within a country. For example in China the footprint in urban areas is close to the European average of 4.7 gha per person but in rural areas it may be lower than 2.0 gha per person.

One Planet Communities aim to follow country specific trajectories, agreed with BioRegional, which take into account differences between and within countries.

1) Global Footprint Network, WWF & Zoological Society of London (2010). Living Planet Report.
2) Based on a population of 7.67 billion, a biocapacity of 1.6gha per person and allowing 20% space for wildlife

Sustainable carbon footprint

The One Planet initiative uses 'consumption-based' carbon footprinting to inform a holistic picture of what causes our greenhouse gas emissions and the most appropriate strategies for reducing them. Consumption based emissions are those that arise all the way through the supply chain. These include not just 'direct emissions' caused by fuel and electricty consumption, but also embodied emissions in goods and services purchased including food, manufactured items and construction materials.

Climate science tell us that in order to avoid runaway climate change, global greenhouse gas emissions need to be reduced by 50% from 1990 levels by 2050[3]. In order for this to happen CO_2 emissions will have to be no more than 1 tonne per person per annum. What is more, we know that emissions are building up cumulatively in the atmosphere which leads to the use of a carbon budget over time[4]. Carbon budgeting shows us that the faster emissions cuts can be made the greater chance there is of stabilising atmospheric concentrations. This means we have to create communities as fast as possible that are powered by renewable technologies and are not locked into ongoing fossil fuel use.

In line with this, the One Planet initiative adopts the principle of Contraction and Convergence which means that countries with high per capita emissions will have to reduce their emissions much more rapidly than countries that currently have low per capita emissions. The end result being that per capita emissions from each country will converge at a more equitable level and the global total of emissions will contract.

BioRegional will work with partners to agree community specific trajectories. For example, for communities in developing countries a suitable trajectory will have to take into account whether the development is targeted at residents with high impact lifestyles or very low income residents with low carbon emissions.

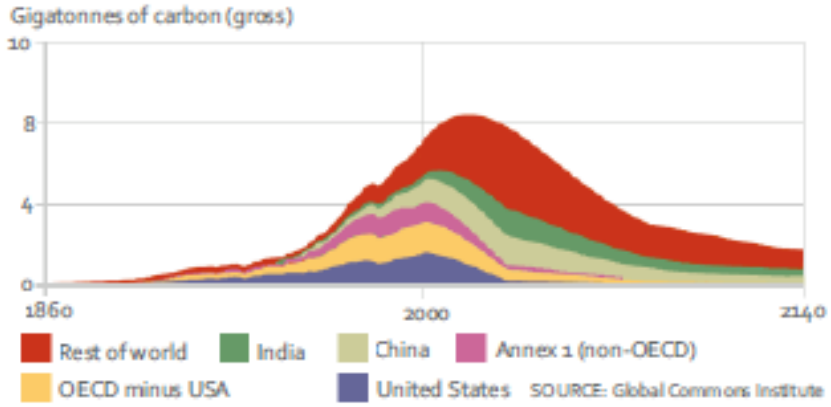

Figure 2: Illustration of contraction and convergence trajectories (source: Global Commons Institute).

3) Climate Change Committee. http://www.theccc.org.uk/topics/science-and-environment/climate-targets-a-global-emissions-trajectories.
4) Based on work done by both the Tyndall Centre, University of Manchester on UK carbon budgets and Meinshausen et al on the global budget.

Clean activities

Each One Planet Community has an ongoing and evolving strategy for avoiding any pollution to air, land or water as a result of activities associated with the community. Energy generation equipment, construction or refurbishment activities, transport vehicles, domestic and non-domestic activities all aim to meet international best practice on pollution prevention. Purchasing systems for materials, equipment, goods or food should check for upstream pollution impacts and choose suppliers with strong environmental track records supporting the emergence of a green supply chain.

Applying the Common International Targets

The programme uses a set of Common International Targets against each of the 10 One Planet principles to ensure that our partners' projects are guided towards a shared end-point by 2020 and to determine what level of performance is required for a development to be endorsed.

In recognition that the solutions for a sustainable future are context specific, the Common International Targets are not intended to be prescriptive but instead provide a guide of how the vision of the One Planet Communities programme can be translated into reality. The targets can be applied flexibly to cope with the unique challenges faced and can be expanded upon to develop more detailed targets for specific countries.

The Common International Targets are supported by a set of guidance notes and position papers, available from BioRegional, which cover the application of these targets in more detail.

Writing a One Planet Action Plan

The One Planet Communities programme asks partner organisations to create an Action Plan for a proposed development, usually with support from BioRegional, which addresses each of the 10 One Planet principles and the corresponding Common International Targets. This Action Plan, and its response to the Common International Targets, forms the basis of BioRegional's decision to grant endorsement and use of the 'planet with a heart' logo to a project or partner.

Once a project has been endorsed, the partner organisation develops a monitoring plan to assess progress against the Action Plan. Monitoring is vital to gain an understanding of how the communities are working and what strategies are most successful in meeting the Common International Targets. A separate guidance note covers development of a monitoring plan.

For full details on the endorsement process and monitoring please refer to One Planet Endorsement and Quality Assurance document.

Spheres of influence

It is understood that in some cases it may not be possible for our partners to meet certain aspects of the targets because of factors outside their control e.g. government regulation on energy supply. In these instances, BioRegional's approach is to document the barrier and support the partner in their attempts to overcome it, for example by engaging with government or by disseminating information and securing wider support.

By way of example, the diagram below illustrates where the greenhouse gas emissions of an average UK resident arise from and the influence that different parties have on this footprint. A developer will need to influence and work with all these parties to produce a truly holistic implementation of the Common International Targets.

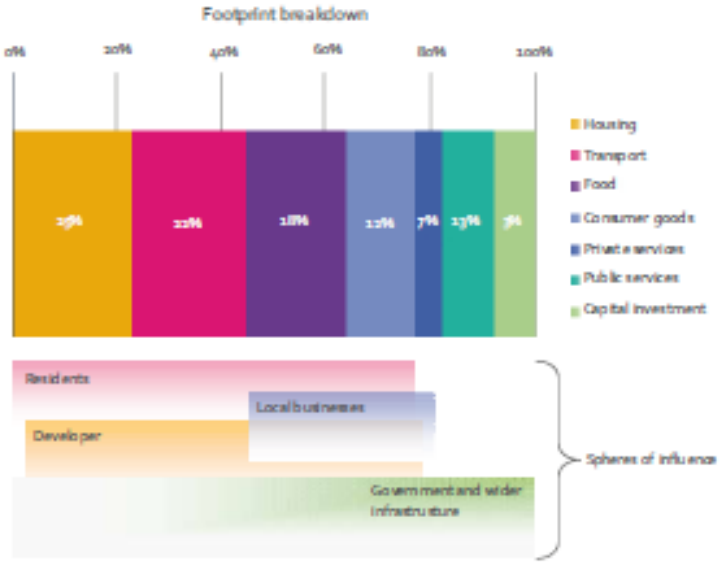

Figure 3: Breakdown of an average UK carbon footprint and the sectors which have an influence over reduction.

The Common International Targets

Zero carbon

The One Planet vision is that all buildings will be energy efficient and run completely from renewable energy.

In order to achieve this, all buildings and structures will be 'net zero carbon' by 2020; powered and heated by a combination of on and off site renewable energy, using fossil fuels only as back up.

All buildings and structures are designed or retrofitted to be energy efficient to country-specific best practice standards and assessed using a specified green building standard such as LEED, BREEAM or Green Star (though these need not always achieve the highest ratings in these systems where the costs outweigh the environmental benefits).

Having minimised energy demand through good design and energy efficiency measures, all the remaining energy demand (including all electricity demand from plug loads) will be met by renewables, for example wind, solar and biomass. Consideration is given to onsite renewable energy generation, particularly heat and hot water, as far as is practically and economically feasible. Adequate levels of onsite generation will be assessed on a project by project basis but all opportunities for renewable generation should be considered.

There should be no fossil fuel energy supplies onsite except as backup to a renewable supply. Any remaining energy demands may be met from offsite renewable energy that, where possible, represents newly installed capacity, or bought through renewable energy power purchase agreements or mechanisms such as the purchase of 'renewable energy certificates'.

The guidance notes provide more detailed advice about permitted renewable energy sources, appropriate use of 'green tariffs' and feed in tariff mechanisms which may apply.

Zero waste

The One Planet vision is of a future where resources are used efficiently, waste levels are close to zero and ultimately zero waste is sent to landfill.

The waste management system for a One Planet Community is designed around the waste hierarchy, prioritising waste prevention first, then re-use, recycling and composting and lastly, energy recovery before disposal to landfill.

There is a presumption of promoting resource efficiency and avoiding wasteful consumption. One Planet Communities promote recycling of waste to high value uses, fostering 'closed loop' recycling and avoiding down-cycling to lower value uses.

A clean energy from waste plant may form part of the zero waste strategy provided international best practice standards on operations and emissions are employed. Energy from waste treatment is only appropriate if treating truly residual waste and therefore not compromising reuse or recycling.

By 2020, at least 70% of domestic waste by weight generated will be reclaimed, recycled or composted. Ideally no more than 2% of waste by weight should be sent to landfill. Country specific targets for total waste production per capita will be set.

The approach to construction waste will include application of a Reuse - Deconstruct - Demolish hierarchy meaning waste from existing buildings is retained and reused in situ wherever possible. Best practice standards in waste minimisation during construction will be employed. At least 95% of waste by weight generated by construction and demolition will be reclaimed or recycled.

Businesses and industries should be able to achieve even higher recycling rates than domestic properties. Consideration will be given to the provision of recycling facilities when building business units and commercial tenants engaged through mechanisms such as green leases and training to ensure the waste hierarchy is followed. Waste arisings will be monitored and benchmarked against good practice in their sector. All waste arisings will follow a trajectory towards zero waste by 2020.

Sustainable transport

The One Planet vision is one where it is easy for people to walk and cycle and low and zero carbon modes of transport are provided. Communities create a green transport plan that results in carbon emissions consistent with the overarching greenhouse gas emissions reduction target.

The green transport plan will consider how best to reduce the need for people to travel by car. Site selection will consider the proximity of local services such as schools, healthcare, business districts, shops and leisure facilities. On site facilities complement local facilities as appropriate.

Having reduced the need to travel, the development provides access to sustainable transport modes. Access to pedestrian and cycle networks, public transport hubs, car clubs and car sharing will all be prioritised.

Consideration should also be given to future green technologies and how the site could be developed to enable these technologies to be incorporated at a later date – for example by installing electric vehicle charging points.

Biofuels may be used to help meet the transport target, but there must be robust proof it is derived from sustainable sources, to be assessed on project by project basis. For example biofuels locally grown on marginal land or waste cooking oil could be considered sustainable.

As an indicator, in the UK a 70% cut in the carbon footprint by 2020 would lead to the transport emissions being approximately 1 tonne per person, per year.

Sustainable materials

The One Planet vision is one where all goods and materials used - for construction or consumer goods - are made from renewable or waste resources with low embodied energy and, wherever possible, sourced locally.

Construction and refurbishment activities will be designed to minimise the impact of the materials used and the maintenance required. Project specific targets will be developed for these strategies.

One Planet Communities will:

- Make optimum use of all existing buildings and infrastructure and think creatively about designing out the need for some conventional built requirements – e.g. reducing paved areas and hard landscaping, avoiding suspended ceilings, etc.;
- Measure (or at least have a strategy in place to assess) the embodied CO_2 of materials throughout the design and construction processes and use this as one of the decision making criteria from the outset; have strategies in place to minimise the embodied CO_2 of any construction and refurbishment work;
- Prioritise construction materials that are low impact, durable, local and reclaimed. Where possible high impact or polluting materials (for example PVC and aluminium) will be avoided. The key impact areas will be identified and plans developed to reduce the impact of these materials;
- Consider the life cycle impact of buildings in design. This means design and materials choices that enable easy maintenance and longevity. Buildings will be designed with consideration for deconstruction so that on decommissioning the materials can be recovered and re-used.

Strategies to enable residents and workers to reduce consumption and choose low impact goods will be implemented. Options could include:

- Providing information on reducing the impact of goods through community information services e.g. welcome packs and a community intranet;
- Providing services that facilitate the sharing of goods, especially goods that are used infrequently but have a high embodied energy for example power tools;
- Providing access to durable goods, electrical appliances and furniture, with low impact in manufacture;
- Attracting property management companies and other service providers to the community who will support the One Planet approach.

Local and sustainable food

The One Planet vision is one where people are able to eat diets high in local, seasonal and organic produce, as well as healthy diets high in vegetable protein and lower in animal protein than is the norm in many countries with a high ecological footprint.

One Planet Communities will develop strategies to enable and encourage residents to adopt a One Planet diet, through education and agreements with onsite retailers and caterers.

Onsite facilities, including retail and catering facilities, will strive to minimise packaging in line with zero waste targets, and minimise consumption of processed foods which have high a ecological footprint. Food waste from all residents, tenants, businesses, restaurants and shops will be minimised.

Food growing will be integrated onsite where appropriate such as through space for 'urban farming', allotments and window boxes. Strategies will be put in place to enable and encourage residents to take up food growing onsite. Local food mapping will be undertaken and links will be developed with local producers to establish regular supplies and to work with them to further reduce their impacts.

Purchasing systems will be established to ensure food provided does not contribute to deforestation, over-fishing or pollution and minimises other negative impacts, for example, through Marine Stewardship Council seafood or sustainably sourced palm oil.

Sustainable water

The One Planet vision is that we use water much more efficiently in buildings and in the products we buy; and manage water in such a way as to support healthy land-use, avoid local flooding and avoid pollution to watercourses.

Best practice standards in water conservation, water efficiency, recycling and surface water management will be adopted taking into account the local context. Where there is no country specific best practice the water strategy will need to consider local issues such as water availability and typical consumption levels to establish a target for the project. The key aspects are:

- All residents have access to safe potable water;
- The water strategy will look to reuse water where there is no adverse energy impact from doing so;
- Communities assess the carbon impacts of their water strategy;
- Communities implement a water reduction and re-use strategy to engage residents and tenants long term;
- In areas of flood risk, communities should have an acceptable 200 year flood risk strategy;
- Communities consider, and are designed to adapt to, climate change;
- In areas prone to flood risk, communities adopt a best practice approach to water drainage and storm water, ensuring that peak run off rates and annual run off volumes will be no greater than the previous conditions for the site. Examples of these systems include Sustainable Urban Drainage Systems, Water Sensitive Urban Design and Best Management Practice.

It is acknowledged that the emerging concept of 'embodied water' (water used in the production of food and manufactured goods) is becoming more important and will be an increasingly important consideration of the Local and Sustainable Food and Sustainable Materials principles.

Land use and wildlife

The One Planet vision is of communities that contribute to an overall increase in biodiversity and biological productivity, as well as supporting beautiful landscapes.

To ensure a net positive contribution to local native biodiversity and natural habitats a management plan will be developed, resourced and financed alongside the property management plan. Such a plan will:

- Support collaboration between professional ecologists and project landscape architects with long term input from local conservation groups;
- Identify key species that are either protected or locally significant and monitor these to increase their presence;
- Include a comprehensive planting scheme with a selection process that benefits local wildlife, addresses local climate issues (e.g. drought tolerance) and avoids invasiveness species;
- Have a demonstrable positive impact of the ecosystem services to people living at, and outside of, the community such as: through provision of food & timber, climate regulation, water management, water quality, recreational spaces, good aesthetics, spiritual benefits, soil formation and carbon sequestration.

Opportunities for education around land-use and ecosystems will be identified.

At least one opportunity will be identified as a showcase to publicly report on actions taken to benefit biodiversity within the development and lessons learned. In addition, at least one opportunity must be identified to regenerate degraded local natural resource stocks (soils, trees, fisheries, etc) either on or off site and a plan implemented.

Leading ecologists suggest that there is a global need for 20% of biologically productive land to be left for wildlife, this would equate to 0.3 ha of wildlife habitat per resident somewhere in the world. The developer will look for ways to showcase how they are contributing to this global target by facilitating the establishment or enhancement of valuable wild space on site or elsewhere.

Culture and heritage

The One Planet Vision is one where a culture of sustainability and community has been nurtured. Endorsed communities will build on local cultural heritage to foster a sense of place and belonging.

One Planet Communities endeavour to develop a thriving sense of place and build connectedness and social capital. This has been shown scientifically to improve health and reduce crime (and fear of crime).

A site specific plan to maintain, enhance and revive valuable aspects of local culture and heritage will be developed. Community involvement in the writing and delivery of the plan is central to the process. In addition, two locally specific showcase projects that deepen the local sense of culture and heritage will be identified and delivered. The approach and scale of the showcase projects will be agreed on a project by project basis and will be at a scale commensurate with that of the development.

A One Planet Centre will be provided (perhaps as part of a broader community centre) to inform residents and visitors and to help create a new culture of sustainability.

A key measure of the strength of a community is the number of the neighbours known by name. This will be surveyed annually in endorsed communities.

Equity and local economy

The One Planet vision is one where thriving, diverse and resilient local economies support fair employment, inclusive communities and international fair trade.

One Planet Communities adopt strategies for the key themes below and aspire to global best practice in both the construction and operational phases:

- Employment - in particular promoting jobs in the green economy;
- Equity and inclusiveness - physically and socially;
- Participation;
- Ownership and affordability;
- Certified Fairtrade goods.

One Planet Communities aim to improve the welfare of selected disadvantaged groups. Two priority groups within the local context will be identified and through discussion with them or their representatives, actions taken to improve their welfare. The approach and level of support will be determined on a project by project basis but should be provided at a scale commensurate with that of the development.

Health and happiness

The One Planet vision is to create a future where it is easy, attractive and affordable for people to lead happy and healthy lives within a fair share of the earth's resources.

A plan for promoting the health and happiness of residents will be produced, building on emerging findings from health promotion and happiness research. One Planet Communities are expected to adopt an exemplar approach during construction and long term community management, aspiring to global best practice.

One Planet Communities will complete two showcase initiatives to promote health and happiness in the community. Suitable projects will be identified using baseline data to benchmark the local context, identifying specific areas of need. The approach and level of support will be determined on a project by project basis but will be provided at a scale commensurate with that of the development.

Examples of showcase projects could include:

- Supporting people in overcoming chronic illness and unhealthy lifestyles through promoting active travel and healthy diets;
- Facilitating inter-generational skills sharing or activities;
- Provide the tools and facilities to create an enterprising community that benefits the local economy;
- Ways for people to take responsibility for their own happiness for example through positive psychology and meditation.

Residents' satisfaction levels will be monitored on an annual basis.

Business and Organization Specific

ONE PLANET COMPANIES

One Planet Companies

Commitments and targets for exemplars in sustainability

BioRegional

solutions for sustainability

Introduction

ONE PLANET COMPANIES

Globally we are consuming resources and polluting the planet at a level forty per cent higher than the earth can renew or absorb annually. If our demands on the planet continue at the same rate, by 2030 we will need the equivalent of two planets to maintain our lifestyles[1].

But we don't have two planets. We have only one. BioRegional is responding to this by initiating and delivering practical solutions that help us to live within a fair share of the earth's resources – what we call one planet living. The business community is, we believe, a crucial part of the solution.

In an increasingly crowded green marketplace, businesses need a clear, differentiated and easy to communicate approach to sustainability that inspires action and drives real ambition. We believe that the One Planet Living approach provides that solution – and so do our partners (see page 16).

This booklet is aimed at those companies and organisations who are starting out on the One Planet journey. We hope you feel inspired by it and will decide to join the One Planet Companies programme.

[1] WWF Living Planet Report 2010

The 10 principles of One Planet Living

The programme uses a set of commitments and targets against each of the 10 One Planet principles. Because solutions for a sustainable future are context specific, these targets are not intended to be prescriptive but instead help companies translate their vision into reality. The targets can be applied flexibly to cope with the unique challenges faced and can be expanded upon to develop more detail for specific countries and industry sectors.

Zero carbon	making buildings more energy efficient and delivering all energy with renewable technologies
Zero waste	reducing waste, reusing where possible, and ultimately sending zero waste to landfill
Sustainable transport	encouraging low carbon modes of transport to reduce emissions, reducing the need to travel
Sustainable materials	using sustainable and healthy products, such as those with low embodied energy, sourced locally, made from renewable or waste resources
Local and sustainable food	choosing low impact, local, seasonal and organic diets and reducing food waste
Sustainable water	using water more efficiently in buildings and in the products we buy; tackling local flooding and water course pollution
Land use and wildlife	protecting and restoring existing biodiversity and natural habitats through appropriate land use and integration into the built environment
Culture and community	reviving local identity and wisdom; supporting and participating in the arts
Equity and local economy	creating bioregional economies that support fair employment, inclusive communities and international fair trade
Health and happiness	encouraging active, sociable, meaningful lives to promote good health and well being

One Planet Companies

One Planet Companies act as inspiring examples of sustainability. They commit to providing products and services which help people lead happy and healthy lives within a fair share of the earth's resources; and to reducing the impacts of their operations to a truly sustainable level, by 2025. Organisations will need to address the impacts of the following key areas and activities:

- Products and services
- Company operations
- Supply chain

Becoming an endorsed One Planet Company

Partner organisations create a One Planet Action Plan for their company operations, usually with support from BioRegional, which addresses each of the 10 One Planet principles and the associated commitments and targets summarised in this document. This Action Plan forms the basis of BioRegional's decision to grant endorsement and the 'planet with a heart' logo to a company partner.

Once an organisation has been endorsed the partner organisation develops a monitoring plan to assess progress against the Action Plan. Monitoring is vital to gain an understanding of how companies are delivering against the objectives set out in the Action Plan and what strategies are most successful in meeting the targets. BioRegional undertake an Annual Review of progress for every endorsed partner.

Sustainable carbon footprint

The overarching Sustainable Carbon Footprint target for all companies is to make an absolute reduction in the organisation's carbon footprint of 90% by 2025 against a recent baseline year.

BioRegional will work with partners to agree organisation specific baselines, boundaries and trajectories for reducing CO_2 emissions but will look to be in line with a 90% absolute reduction by 2025, against a recent baseline year.

This will apply to all Scope 1 and 2 emissions with Scope 3 (see figure 1) activities to be agreed with each organisation, informed by their ability to measure and reduce. All greenhouse gas measurement and reporting is in line with standards set within the GHG protocol.

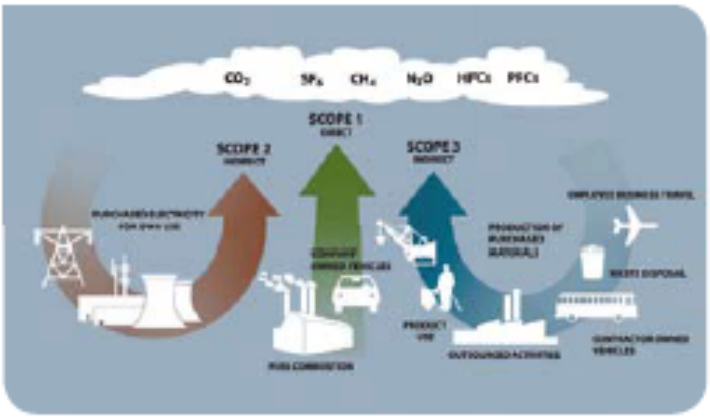

Figure 1: Scope 1, 2 and 3 greenhouse gas emission categories

Zero carbon

Target: all buildings and structures occupied by the company will be 'net zero carbon' by 2025; powered and heated by a combination of on and off site renewable energy.

The One Planet vision behind the zero carbon principle is that all buildings will be energy efficient and run completely from renewable energy.

Having minimised energy demand through good design and energy efficiency measures, all the remaining energy demand will be met by renewables as far as is practically and economically feasible. This might include for example wind, solar and biomass.

Remaining energy demands will be met from off site renewable energy that represents new installed capacity or through renewable energy power purchase agreements.

Any products or services should not result in an unnecessary increase in energy consumption and companies should offer products and services that will enable customers or clients to reduce their carbon footprint where appropriate to an organisation's enterprise.

Zero waste

Target: reduce total waste generation by 30% by 2025 against an agreed baseline. At least 90% of waste will be recycled or reused by 2015 and 98% by 2025.

The One Planet vision is a future where resources are used efficiently, leading to waste levels that are close to zero and ultimately zero waste is sent to landfill.

Across all premises under direct control of the organisation, the waste management system in place will be designed around the waste hierarchy, prioritising waste prevention first, then re-use, recycling and composting, then lastly energy recovery before disposal to landfill.

Energy from waste may form part of the zero waste strategy provided careful monitoring of emissions is in place and international best practice standards on operations are employed and provided a 90% reuse and recycling rate has been achieved.

Packaging targets to reduce volumes and increase the use of post consumer recycled content will also be included. Where appropriate, companies can look to participate in take back schemes for end of life products.

Sustainable transport

Target: Reduce emissions from business travel and domestic haulage by at least 50% by 2025, or greater, in line with the sustainable carbon footprint target.

The One Planet vision of the future is one where need to travel has been reduced and low and zero carbon modes of transport are provided.

Companies will need to reduce the impact of any haulage they undertake through improving the efficiency of goods transportation and maximising the use of local suppliers where appropriate.

For business travel, companies will seek to reduce the need to travel and implement initiatives to reduce car use and flights. Companies might enable footprint reductions through initiatives including staff travel plans and incentives for reducing private car travel.

Position on alternative fuels

Biofuels may be used to help meet the transport target, but there must be robust proof it is derived from sustainable sources. Electric vehicles are also proven to reduce CO_2 emissions from transport, especially when the electricity is from renewable sources.

Sustainable materials

Target: establish ethical, social and environmental component of supplier assessment process by 2015. Achieve 100% sustainable sourcing of at least one key commodity by 2015 and all materials by 2025.

The One Planet vision of the future is one where all goods and materials used are made from renewable or waste resources with low embodied energy and wherever possible are sourced locally.

Materials procured by a company fall under two broad categories:

- goods and services for resale – any product or service sold by a company
- goods and services not for resale – any other product, material or service procured by the company e.g. office supplies.

For both of these, companies need a comprehensive understanding of what they procure and of the ecological and GHG footprints of these goods. High areas of impact in the supply chain can then be addressed as a priority. Some common policies upheld by companies may include chemicals and pesticides, sustainable timber sourcing, sustainable palm oil and eliminating peat based products.

Local and sustainable food

Target: ensure that 50% of food by value purchased by the organisation is compliant with the local and sustainable food policy by 2015 and 100% by 2025.

The One Planet vision is one where people are able to eat diets high in local, seasonal and organic produce, as well as healthy diets higher in vegetable protein and lower in animal protein than is the norm in many countries with a high ecological footprint.

Companies whose business does not involve selling food items can look to adopt sustainable food purchasing in relation to any non-merchandise such as staff canteens and vending machines.

Transparent purchasing systems will be established to ensure food provided does not contribute to deforestation, over-fishing or pollution and minimises other negative impacts, for example, by adopting Marine Stewardship Council seafood or sustainably sourced palm oil. This will be embedded into a sustainable food policy and standards for food vendors that supply canteens, cafes, event catering and vending machines, as well as any retail/ wholesale food products sold by the organisation.

Sustainable water

Target: companies measure their water use and set targets for absolute reduction in line with industry best practice or at least 10% by 2015 against a recent baseline year.

The One Planet vision is that we use water much more efficiently in buildings and in the products we buy; and manage water in such a way as to support healthy land-use, avoid local flooding and avoid watercourse pollution.

Companies must calculate their water consumption and report these figures annually. Targets beyond 2015 will be developed based on an evaluation of company buildings and operations to identify further reduction opportunities.

Key aspects include:

- all premises will implement a water reduction strategy and set targets to reduce total mains water consumption
- products sold by a company should be water efficient both in the manufacturing (embodied water) and end use (where applicable).

Land use and wildlife

Commitment: companies commit to increasing levels of biodiversity and space for wildlife through the products they sell or purchase, enhancements carried out on site or through time or financial support to an appropriate wildlife charity or initiative.

The One Planet vision is of organisations that have contributed to an overall increase in biodiversity and biological productivity.

Protection and enhancement of natural habitats and wildlife must be delivered across company operations. This can be achieved through:

- ensuring responsible sourcing of materials and eliminating the use of materials such as peat, palm oil grown in former rainforest habitats and other products associated with the destruction of natural habitats
- community involvement – helping customers or clients make a positive impact to local wildlife
- managing any land or roof space under a company's control for maximum benefit to habitats and wildlife.

Culture and community

Commitment: companies promote an understanding of One Planet Living to their staff, commit to providing financial support or staff time to community projects with targets set for 2015 and 2025.

The One Planet vision is one where a culture of sustainability, community and a sense of place have been nurtured. Endorsed organisations will build a culture of sustainability in the workplace and across the communities they touch.

Companies will endeavour to maintain, enhance or revive aspects of culture local to the areas in which a company operates. This can be achieved through a programme of community engagement with a company contributing skills to selected community projects. Charitable giving is also recognised here.

One Planet Companies ensure all staff are aware and engaged in the organisation's sustainability commitments, trained in One Planet Living and embedding the concept into the values of the organisation through, for example the use of One Planet Champions and staff inductions.

Equity and local economy

Targets: companies have a robust process in place for assessing suppliers against ethical, social and environmental criteria by 2015. All suppliers will meet good practice for sustainable and ethical sourcing by 2025.

The One Planet vision is one of exemplary supply chain and employment standards that ensure safe and healthy conditions for workers who are treated properly and whose rights are respected.

Companies must have a code of conduct in place that applies to their own operations and their supply chain. A code of conduct should include issues of wages, hours of work, health and safety, discrimination, child labour, forced labour, and supply chain transparency in the environment. Companies will need to train relevant members of staff in responsible buying to reinforce the importance of the code of conduct.

To meet the targets for Equity, companies will enable suppliers to make measurable improvements to working standards through collaboration and training. Benchmarking suppliers will help to identify good practice and the information used to improve supplier performance in relation to the code of conduct.

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Health and happiness

Target: To promote physical and mental well-being in the organisation, and achieve best practice in employee engagement based on the Gallup 12 survey or equivalent with a minimum participation of 80% and an average score of 4.15 out of 5.

The One Planet vision is to create a future where it is easy, attractive and affordable for people to lead happy and healthy lives within a fair share of the earth's resources.

Key to employee engagement is encouraging flexible working around traditional areas such as childcare as well as using it to encourage employees to pursue further education, carry out voluntary work or other commitments outside the work place. Training schemes will also be made available to help people progress through a company, develop new skills or update their area of expertise.

If employees are encouraged to protect their physical and mental health, this will enable them to deal more effectively with unavoidable stresses. Organisations can help by offering:

- regular opportunities to review work-life balance e.g. through appraisals and one-to-ones
- information and guidance on health issues and health screening
- sports and social clubs and activities.

If your company or organisation is interested in joining the One Planet Companies programme please contact:

Jim Fielder
Head of Sustainable Business
020 8404 4894
jim.fielder@bioregional.com

Hayley Bell
Sustainable Business Manager
020 8404 6080
hayley.bell@bioregional.com

BioRegional is an entrepreneurial charity which initiates and delivers practical solutions that help us to live within a fair share of the earth's resources – what we call one planet living. Our One Planet initiative consists of a range of practical projects and partnerships with companies, developers and local authorities.

BioRegional
solutions for sustainability

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Appendix B: Principles Matrix

Principles	What WPI Does	What is Desired	Suggestions for Improvement
Zero Carbon	• Electricity usage monitoring on 11 buildings on campus • Gas usage monitored in main power plant • 35 solar panels above the sports and recreation center • LED Lighting installed as projects permit • Occupancy sensors for lighting installed as projects permit • Energy Management System • Computers in labs are to be powered down [at night?] according to institutional policy • Projectors to be powered down at night according to institutional policy • Energy Star and EPEAT ratings are priority when acquiring technology • Energy Star appliances purchased for residence halls • New buildings must meet LEED certification	• Reach net zero carbon by 2025 • Design or renovate buildings to reduce energy consumption • Use on or off site sources of renewable energy to meet all needs • Use fossil fuel for back up only • Achieve LEED platinum rating for all new buildings	• Utilize roof space of buildings to assist in efficiency and carbon emissions of the building. Some examples of enhanced roofs include white reflective roofs, roof top solar panels, and roof top gardens. • Better controlled lighting and HVAC systems. • Earn points from the Energy & Atmosphere LEED credit library. • Install wind turbines.
Zero Waste	• 100% of WPI waste diverted from landfills-either recycled or sent to waste-to-energy	• Use waste hierarchy to accomplish desired waste reduction. First	• Reorganize WPI's recycling program. Investigate the dispersal and placement of

	incinerator • Recycles 24% of waste • waste audit first 2011; projected to become annual event • RecycleMania- 7th best improved paper recycling • Goddard hall renovations - 94% waste diverted from landfills • East Hall renovations - 93.4% waste diverted from landfills • Re-usable containers used in dining hall • Discount offered for use of re-usable containers for coffee • Yard waste composted by contractor • Construction waste management will be addressed in phase two report • 30% recyclable paper (print shop) • Donation bins at end of each academic year to prevent items from being thrown out • New buildings must meet LEED certification	level is waste prevention followed by reuse, high efficiency recycling, and composting. Last level is energy recovery. • Have at least 70% of waste reclaimed, recycled, or composted by 2020. • Send only less than 2% of waste to landfills. • Waste generated by construction should be 95% reclaimed or recycled.	recycling bins. Educate the WPI community about recycling on-campus. Initiate an advertising campaign to increase on-campus recycling efforts. • Install high efficiency hand dryers and place stickers on remaining paper towel dispensers encouraging sustainable use of the paper. • Phase out the sale of disposable plastic water bottles on WPI's campus. Install additional water bottle refill stations such as those in the recreation center. Provide incoming freshman with reusable water bottles as a part of the Insight Program.(see http://www.wpi.edu/academics/Undergraduate/FirstYear/insight.html for more information) •
Sustainable Transport	• ZipCars, SNAP van, consortium shuttle, City Ride, Carpool World (not really used) • Electric Vehicle Charging Station • Interior storage for bicycles in	• Reduce the need for car travel, giving the community access to types of sustainable transport, and investigating "green"	• Convert WPI's vehicle workforce to hybrid, electric, and biodiesel vehicles. • Reserve additional parking spots for carpoolers and low carbon vehicles in preferred locations.

	East Hall available to all residential students • 12 parking spaces for Hybrid or alternative fuel vehicles	vehicle technology	
Sustainable Materials	• Green cleaning products used "as much as possible" • Some furniture fabric in East hall made from recycled yarn and materials • New buildings must meet LEED certification	• Establish ethical, social and environmental supplier assessment processes by 2015. • 100% sustainable sources by 2025, • Construction activities should minimize the impact to the environment and require less maintenance.	• Switching to biodegradable food containers and utensils • WPI can strive to earn LEED platinum certification • Develop a set of standards to assess companies' processes and sources.
Local and Sustainable Food	• As of 2012, 27% of Chartwells food budget is spent on food from local sources • Pre-consumable and post-consumable waste is composted by local farmers • Some herbs used in dining hall grown in East Hall rooftop garden • Herbs also gathered from Higgins House garden for dining hall • Cage-free eggs • Monterey Bay Aquarium Seafood Watch list sustainable seafood	• Purchase local, seasonal and organic produce, as well as have healthy diets that are high in vegetable protein. • 50% of food purchased by the organization to be compliant with the local and sustainable food policy by 2015 • 100% of food purchased compliant by 2025. • Transparent purchasing practices.	• Investigate creating a student run garden. • Offer more locally grown food from Massachusetts Community Supported Agriculture Farms. • Host more farmers markets on campus.

	• Fair trade coffee • Antibiotic and hormone free foods • Vegan and vegetarian dining options available during all meals		
Sustainable Water	• Storm water collection system above the sports and recreation center, stored in two 2,500 gallon tanks underneath the quadrangle. This water is used in the cooling system which saves about 800,000 gallons of water yearly. • East hall green roof was projected to cut stormwater runoff by 50% • Trayless dining (since 2008) - 120,000 gallons of water saved • Follows state mandated policy on stormwater management • Stormwater management will be addressed in the phase two report • All buildings are separately metered for water	• Adopt the best practice standards appropriate to the local context: water conservation, water efficiency, water recycling, and surface water management. • Provide potable water, include the reuse of water in its water strategy, assess the carbon impact of their strategy, engage residents in long term water reduction and reuse strategies, create a strategy for the occurrence of a 200 year flood, and finally, adopt best practice strategies for storm water management.	• Better regulate irrigation. • Install grey water collection systems in new buildings. • Investigate the installation of storm water collection systems. • Install bioswale and/or rain gardens for storm water management.
Land use and Wildlife	• New buildings must meet LEED certification • “green products” used for pest control • East hall- cherry wood	• Preserve local, natural habitats and expanding the areas set aside for wildlife. • Ensure that the	• Plant more native trees around campus and the surrounding community. • Label the campus’ trees and plants and create a website

	sustainably harvested (FSC) • East hall furniture purchased from DCI which is a part of the Sustainable Forestry Initiative • Native plant and sustainable planting practiced • 87% of campus is organically maintained	sourcing of materials does not contribute to any habitat destruction, to regulate land and roof areas to maximize biodiversity, and to involve the community in this process so that residents can contribute in a positive manner.	cataloging trees and plants. • Offer Physical Education credit for gardening and planting.
Culture and Community	• Sustainability focused Academics ○ Environmental & Sustainability Studies BA degree ○ Environmental Eng, Civil Eng, Architectural Eng, BBT, Chem Eng ○ Several graduate programs can special in an area of sustainability ○ There are "at least 66 courses that are either primarily 'focused' on sustainability or significantly 'related' to sustainability." (P1 report) ○ There are sustainability themed GPS, IQPs and MQPs ▪ WPI's President's	• Unite local culture and heritage through community involvement, as well as supporting community projects. • Provide financial support to the community, to encourage charitable giving, to increase community engagement, and to ensure community awareness.	• Increase visibility, awareness, and engagement in regards to sustainability efforts • Spread sustainability education into Worcester schools

	IQP award for science, technology, and societal needs ○ "Seventy-two WPI faculty have been identified with research and scholarship interests in some area of sustainability." (P1 report) ○ Annual Sustainability Reports available to public ○ 32 Global Perspective Program Project Center communities • Optional sustainability session at New Student Orientation • Work on Worcester • Community Engagement and service • Inter-college collaboration on sustainability- SynergE Tri Campus Council • Leftover food donated at start of university breaks • East hall- music practice rooms		
Equity and Local Economy	• Equal opportunity • Retirement plans provided through Tiaa-Creff and Fidelity	• Assess suppliers for good ethical, social, and environmental criteria by 2015. • Purchase only ethical	• Coordinate with existing student organizations to further key themes of this principle. • Establish person(s) to assess suppliers' equity practices.

	• Financial aid for accessibility and affordability of attaining a degree	and sustainable goods by 2025. • Encourage inclusive communities • Encourage community participation	
Health and Happiness	• 20,000 hours of community service in 2012 • $100,000 raised for community service agencies • over 194 clubs for community members • 100% of cooking oil is Trans-fat free • Weekly workshops at rec center to train on equipment usage • Employee training and staff development • Employee satisfaction evaluation • Wellness programs (weight watchers, yoga, etc.)	• Create a plan that promotes both the health and the happiness of the local residents. • Achieve work-life balance, have access to health information and screening, and be offered sport and social clubs and activities	• Offer additional healthy food options. • Offer cooking classes. • Offer more physical education classes that are enjoyable. •

Appendix C: Interview Questions for Chris Sontag

- How long have you been involved with the Student Green Team?
- How did you become involved with the Student Green Team?
- Apart from "Recyclemania", what other events does the Green Team run?
- Are you familiar with One Planet Living and the 10 principles?
    - If no, give brief description.
    - What does the Green Team currently do that relates to the 10 principles?

Our survey was emailed out a couple days ago, would you like to fill one out?

If yes, would you like us to send you the direct link to the survey?

Thank you so much for meeting with us today. Do you have any questions for us?

Appendix D: Interview Questions for John Orr

Introduction

- Thank you for making time for us, we really appreciate it.
- We are students working on our IQP at the Worcester Community Project Center.
- Each one of us introduce ourselves w/ brief info
- Permission for Voice Recorder

Present Project

- Give him OPL handout and our timeline.
- Briefly go over 10 principles.
- At this point in time, we are looking for more solid data on the impact of WPI's various efforts to be sustainable, where WPI is headed and your input on our approach.

So far, we have also interviewed Liz Tomaszewski, Christine Girouard from the community engagement working group, Ryan Pollin, and Chris Sontag of the Student Green Team.

We looked at the annual sustainability reports from 2010-2012 and the Phase One report. Can you recommend any additional documents detailing energy reduction efforts or other changes WPI has made in past years to make it a more sustainable institution?

Also, can you recommend any additional reports that offer statistics on the impact of WPI's efforts thus far?

It was noted in the last campus sustainability session that WPI's changes for success on its

sustainability goals would be stronger if it could either hire a full-time employee focused on accomplishment of the sustainability plans objectives or create a sustainability office. Do you agree with this assessment? And if so, what do you think would be most valuable to WPI?

We understand that developing a specific time frame aligned with feasible accomplishments was challenging. Do you believe having a framework, like the One Planet Living principles, would be beneficial in the development of WPI's sustainability plan?

Would it be possible for us to see results from the Campus Sustainability Plan Update survey that was sent out via email to the campus community with the Phase One report draft? Was this survey developed by the Task Force?

Can you give us a better idea of what it is specifically that GreenerU is doing for WPI? Is it possible that GreenerU could help WPI to work toward adopting the principles?

The goal for our project is to create a plan for the integration of the principles. Essentially we'll be providing WPI with suggestions on how to work toward the Common International Targets for each of the ten principles. Would you be willing to look at some of the suggestions we come up with to help us decide which are most likely to be considered by WPI?

Thank You.

Appendix E: Interview Questions for Elizabeth Tomaszewski

- We are aware that you are the facilities systems manager, the sustainability coordinator, and the advisor for the Student Green Team, could you tell us more about what you do?
- How long have you been involved with the President's Task Force?
    - From what you have seen, what are the biggest accomplishments of the Task Force? What are the biggest challenges the PTFS faces (or the things they struggle most with)?
    - Can you give us a better idea of the internal structure of the PTFS? How do the members and committees work together?
    - Have you found an effective method in gaining the support of the WPI community?
- We have attended two campus-wide sessions and have looked at the Phase One Report. We understand that WPI is currently in Phase Two.
    - Is there a place where we can find the results or findings from the benchmarking (internal and external)?
    - Are the goals set in Phase One (or maybe the prioritized list from Phase Two) something we could find or look at?
- If you don't mind sharing, what is your personal opinion or stance on WPI's current sustainability efforts?

Our survey should be emailed out soon, would you be willing to take the time to fill it out?

If yes, would you like us to send you link directly so it'll be easier to access?

Thank you so much for meeting with us today. Do you have any questions for us?

Appendix F: Interview Questions for Christine Girouard

- We are aware that you direct the Community Engagement working group. How did you first get involved with WPI's sustainability efforts?
    - Can you tell us more about your working group? What is your main purpose? What kinds of tasks did this group work on?
    - How does your working group complete or distribute these tasks?
- What ideas do you have for engaging the community?
    - What methods have you found to be successful?
- If you could just make things happen, what are some things that would help your working group achieve their goals?
- Could you tell us more about your working group's involvement or goals in Phase Two?
- Have you received an email with our survey? We sent it to the faculty, staff, and students email aliases. However, we are still unsure if it went through the staff alias yet.
    - Would you like us to email you the direct link to the survey?
- Do you have any questions for us?

Thank you

Appendix G: Interview Questions for Ryan Pollin

- How long have you been involved with the President's Task Force?
    - We noticed that you wrote the past sustainability reports for WPI. Was this as a member of the President's Task Force?
        - Do you have an official title? What other responsibilities do you have?
        - Are you part of a working group?
        - How did you get involved with campus sustainability?
        - We know you are very active with campus sustainability, but who is your superior or who do you report to?
        - How did you decide what to include the report?
    - Could you tell us more about the structure of the Task Force and how it functions?
        - Is there someone who leads the Task Force?
        - Liz said there are 5-6 students involved. Did the students reached the Task Force or did the Task Force reached the students?
            - How did you and these students get involved?
    - How much were you involved in the phase one development process? Do you know if they have specific goals or actions they would like to take? The Phase One report outlines goals but not specific actions.
- Are you involved in other related clubs on campus?

Our survey should be emailed out soon, would you like to fill one out?

If yes, would you like us to send you the direct link to the survey?

Thank you so much for meeting with us today. Do you have any questions for us?

Appendix H: Interview Questions for Past BioRegional IQP team

- What's your view as a student on BioRegional?
- We're going to have a blog next term during our project. Can we link your sites to our blog?
- Tell us about meetings with the sponsor. How are your interactions with the sponsor?
- Who asked who about bringing OPL to WPI? Your group or the sponsor?
- BioRegional's website said there are 30 employees. Is the organization really that small?
- Did you come up with any specific ideas for integrating the 10 principles on WPI's campus while working on your project?

Thank You.

Appendix I: "What do YOU want for WPI Sustainability?" Survey

Providing WPI with a Framework for Sustainability through One Planet Living

We hope to gather the opinion of the WPI community on the possibility of bringing the One Planet Living global sustainability initiative to WPI's campus. We also would like to measure the knowledge of the WPI community on the current sustainability efforts made by the school. If you have any questions or comments, please feel free to email oplb12@wpi.edu. You can also learn more about One Planet Living at http://www.bioregional.com/oneplanetliving/

WPI Sustainability

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
WPI is a sustainable campus.	○	○	○	○	○
I am familiar with WPI's sustainability efforts.	○	○	○	○	○
I could give specific examples of efforts made by WPI to become sustainable.	○	○	○	○	○
I support WPI's sustainability efforts.	○	○	○	○	○
I would like to get or am currently involved in on-campus sustainability efforts.	○	○	○	○	○
I recycle when on campus.	○	○	○	○	○
There are enough recycling bins on campus.	○	○	○	○	○
When I leave the dining hall or finish eating on campus, I throw leftover food away.	○	○	○	○	○
Chartwells makes efforts to purchase food from local sources.	○	○	○	○	○
I would like to see more small-scale sustainability efforts on campus. An example of a small-scale sustainability effort is the installation of high efficiency hand dryers.	○	○	○	○	○

In relation to WPI's sustainability efforts, what do you think WPI does well?

In relation to WPI's sustainability efforts, what would you like to see changed, improved, or added?

Are you aware of the electric vehicle charging station on campus?

- ○ Yes
- ○ No

Have you used or do you use the electric vehicle charging station?

- ○ Yes
- ○ No
- ○ I do not have a vehicle that can be charged.

Driving on campus

	I don't drive on or around campus	Not Often	Seldom	Often	Very Often
How often do you use the ZipCars?	○	○	○	○	○

Carpooling

	Definitely Not	Probably Not	Maybe	Likely	Definitely
Would you use a carpool service with WPI faculty, staff, and students like Carpool World to travel or commute?	○	○	○	○	○

Did you know East Hall has a green rooftop?

- ○ Yes
- ○ No

Did you know that East Hall has interior storage for bikes?

- Yes
- No

Do you use the interior bike storage located at East Hall?

- Yes
- I would if I knew how and/or had a bike on campus
- No

Did you know about the stormwater collection system on the roof of the recreation center and the connected storage tanks underneath the quadrangle?

- Yes
- No

Leadership in Energy and Environmental Design (LEED) is a building rating system that was developed by the U.S. Green Building Council. Did you know that since February of 2007 the construction of all new buildings must at least earn the minimum LEED rating of Certified?

- Yes
- No

Which WPI buildings have received or are projected to receive a LEED rating of Certified or higher?

- East Hall
- Goddard Hall
- Recreation Center
- New residence hall located on Faraday Street
- Bartlett Center
- Campus Center

Please list any clubs and organizations you know of that are involved in WPI's sustainability efforts.

How plausible do you believe it is for WPI to make efforts to apply each of the One Planet Living principles in its sustainability plan and attempt to meet the Common International Targets?

One Planet Living is a global initiative which provides communities with a framework for becoming sustainable through the application of ten principles. Communities strive to meet a set of Common International Targets provided by One Planet Living for each principle. Once they have done so, the communities are endorsed by and then officially labeled as a One Planet Living community. The achievement of the Common International Targets demonstrates that the community is on track to achieving the principles. Each principle and an explanation is displayed below.

	Not Plausible	Barely Plausible	Neutral or Unsure	Plausible	Very Plausible
Zero Carbon: making buildings more energy efficient and delivering all energy with renewable technologies.					
Zero Waste: reducing waste, reusing where possible, and ultimately sending zero waste to landfill.					
Sustainable Transport: reducing the need to travel, encouraging low carbon modes of transport to reduce emissions.					
Sustainable Materials: using sustainable healthy products, with low embodied energy, sourced locally, made from renewable or waste resources.					
Local and Sustainable Food: choosing low impact, local, seasonal and organic diets and reducing food waste.					
Sustainable Water: using water more efficiently in buildings and in the products we buy; tackling local flooding and water course pollution.					
Land Use and Wildlife: protecting and restoring biodiversity and natural habitats through appropriate land use and integration into the built environment.					
Culture and Community: reviving local identity and wisdom; supporting and participating in the arts.					
Equity and Local Economy: creating bioregional economies that support fair employment, inclusive communities and international fair trade.					
Health and Happiness: encourage active, sociable, meaningful lives to promote good health and well being.					

Suggestions for Helping WPI Achieve the Principles

Which of these suggestions do you believe WPI should or could implement?

	Least Preferred	Less Preferred	Neutral or Unsure	Preferred	Most Preferred
On-campus bicycle lending system for faculty, staff, and students					
More plastic, aluminum, and glass recycling bins around campus					
More paper recycling bins around campus					
More battery recycling bins around campus					
More water bottle refill stations like those in the Recreation Center					
High efficiency hand dryers					
More self-powered exercise machines for the Recreation Center					
Less plastic or styrofoam food containers used at eateries on campus					
More motion detector controlled lighting or heating and cooling					
More ZipCars					
Use of reclaimed water for watering of campus grounds					
Implement more green rooftops like that of East Hall					
Install more solar panels on rooftops like those on the Recreation Center					
Install wind turbines on or around campus					

Do you have any suggestions that could help WPI achieve any of the principles listed above?

Thank you very much for your time!

Submit

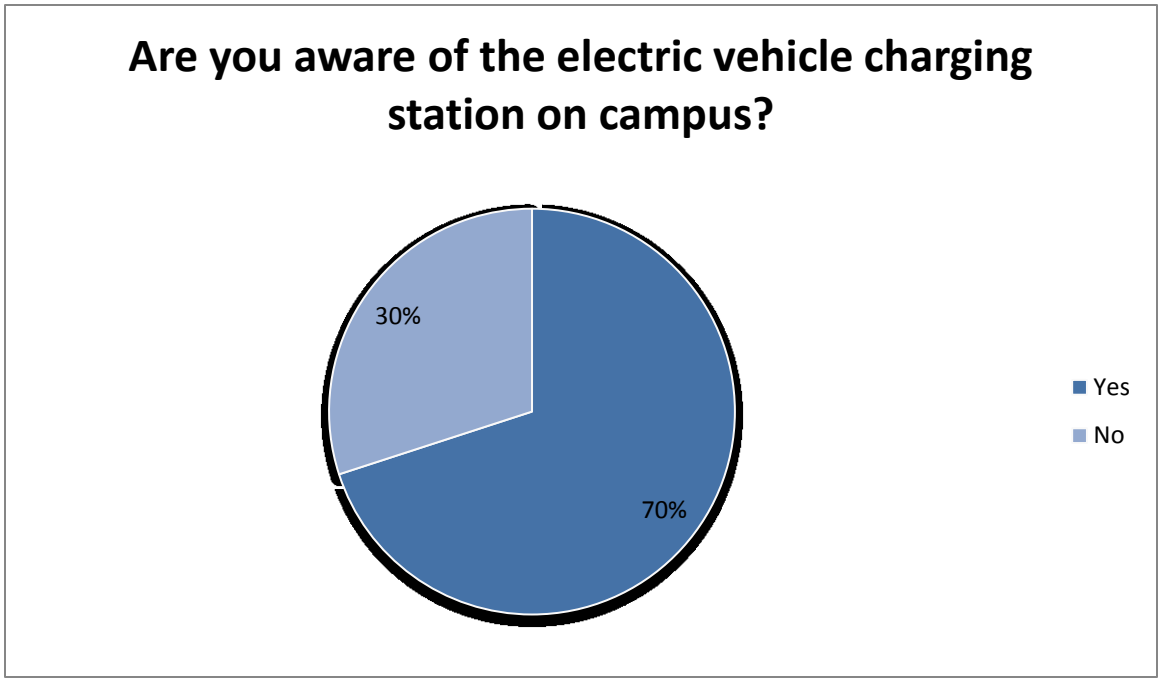
Appendix J: Sustainability Comparison Matrix

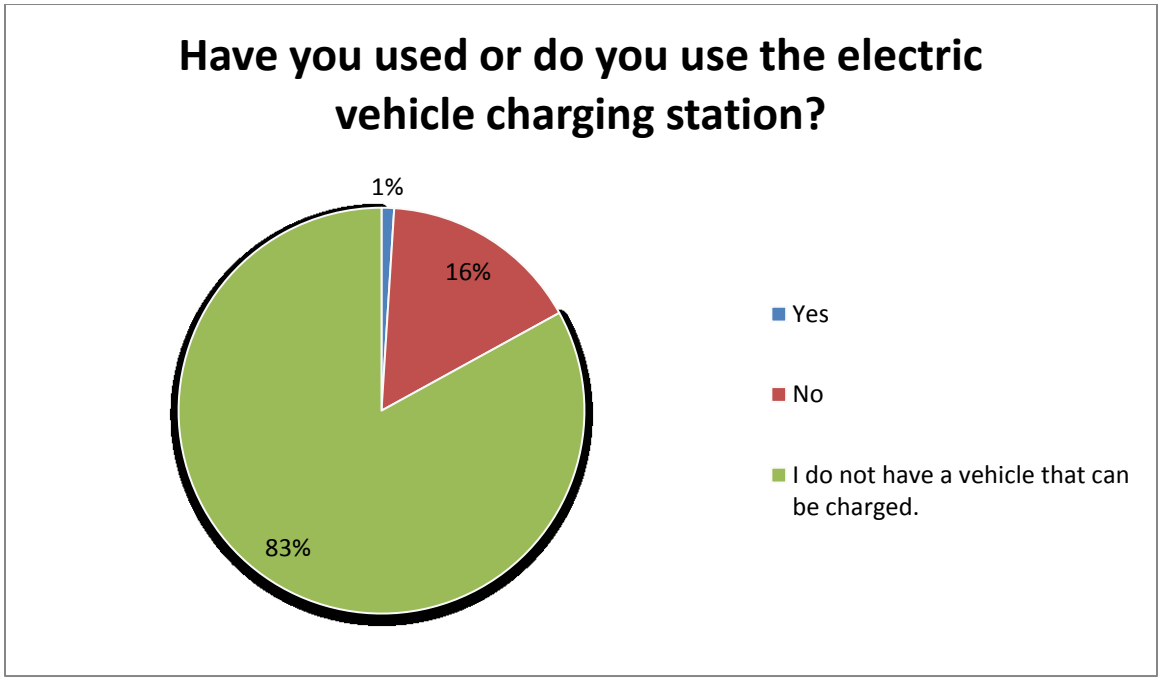
	WPI	OPL	AASHE	ULSF	ACUPCC
Focus	environmental preservation social equity economic prosperity 4 working groups: Academic Programs, Campus Operations, Community Engagement, Institutional Policies and Practices	live and work within the planet's resources make sustainable living easy and affordable for all Provide framework for communities to become sustainable	helps institutions reach their sustainability goals through "empowerment"	teaching, research, operations, and outreach publication, research, and assessment	commitment to global climate disruption prevention completion of emissions inventory, set a target date and milestones for climate neutrality, immediate efforts to reduce GHG emissions, integration of sustainability into curriculum, creation of an action plan and making progress and inventory reports publicly available
Regulations/ Components	Starting in Feb 2007, all new buildings must be designed to be at least LEED certified	The 10 principles Common International Targets	STARS program advisory council senior council	Secretariat for Talloires Declaration Provides resources such as: sustainability assessment questionnaire (SAQ), university and college sustainability websites, list of sustainability or sustainable	provides a framework and support to implement climate action plans (to achieve climate neutrality) Annual Report on progress made by signatories

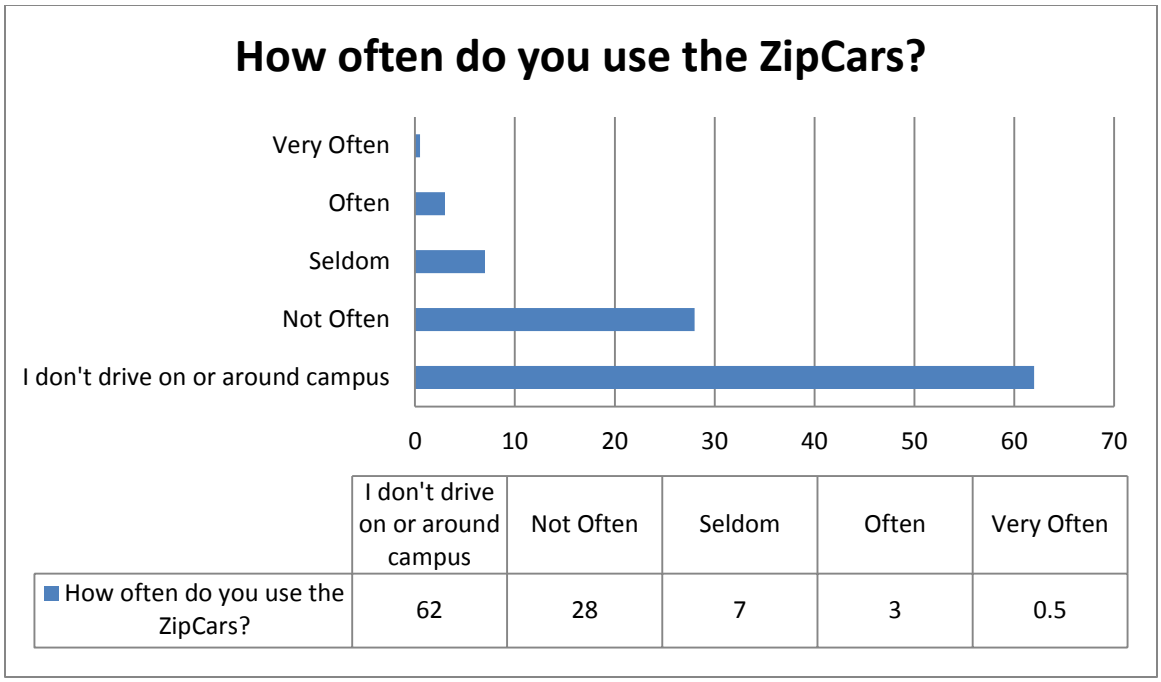
				development themed majors/degrees with criteria provided by several institutions	
Community Involvement	Campus sustainability planning sessions Community Engagement committee	n/a	awards newsletters member discounts network at annual conference and expo webinars workshops	partners with Association for Promoting Sustainability in Campuses and Communities (APSCC) Part of Global higher Education for Sustainability Partnership	partners with AASHE
Actions	Two-year planning process (Phase One & Two) employing GreenerU annual sustainability reports	Creation of One Planet Living communities BioRegional endorsement when project shows potential	annual reports member-only resource center members can now access Australasian Campuses Towards Sustainability (ACTS) and the United Kingdom's Environmental Association for Universities and Colleges (EAUC) (both sister organizations of	Secretariat for Talloires Declaration Earth Charter Initiative	Signatories agree to initiate the development of a plan to achieve climate neutrality as soon as possible, initiate two or more actions from a provided list to reduce GHG emissions, make the action plan, inventory, and progress reports available to the public

		AASHE) supports and promotes ACUPCC

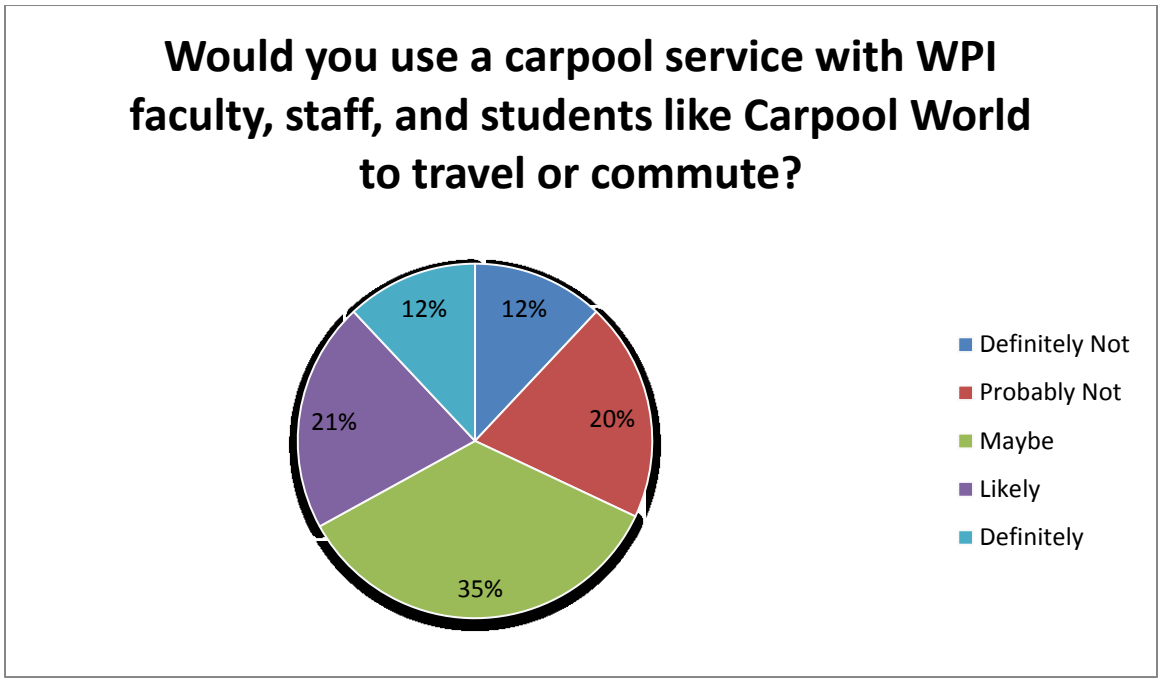
Appendix K: Survey Questions Demonstrating WPI Community Knowledge on WPI Sustainability Efforts

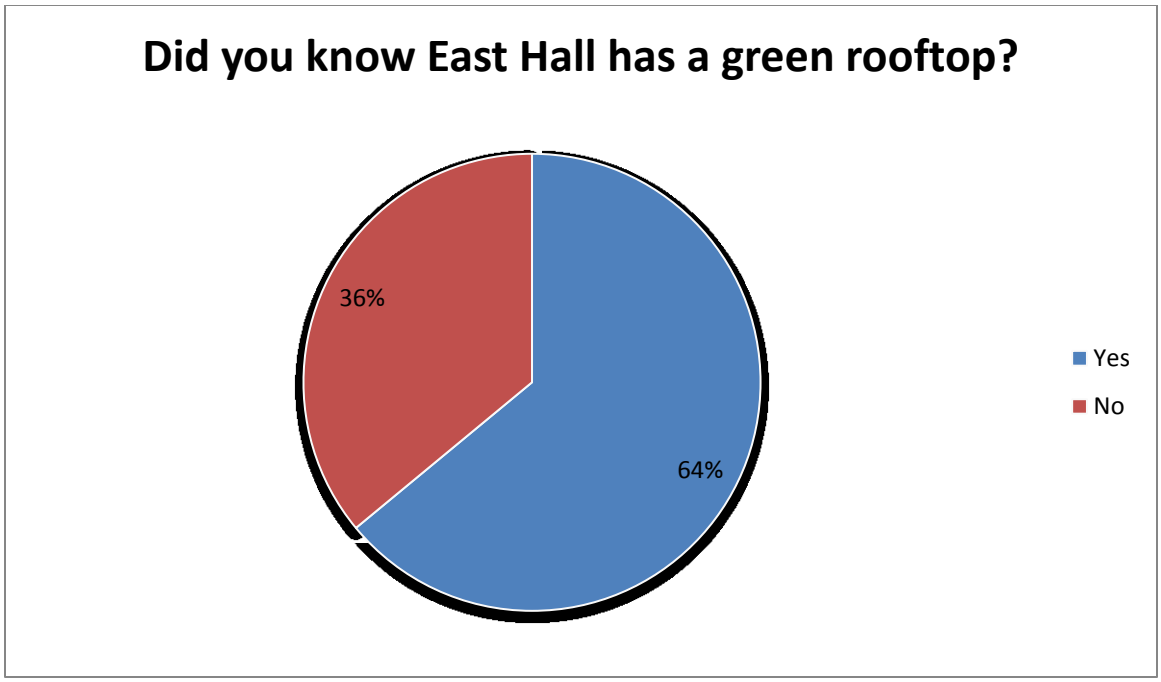


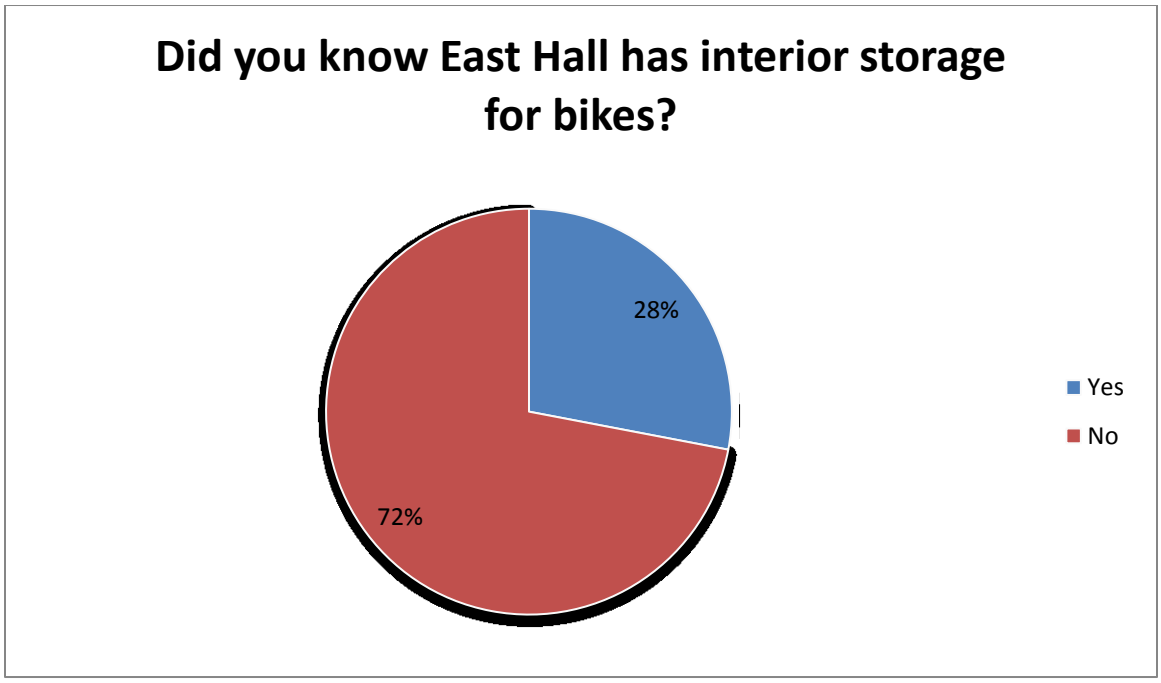


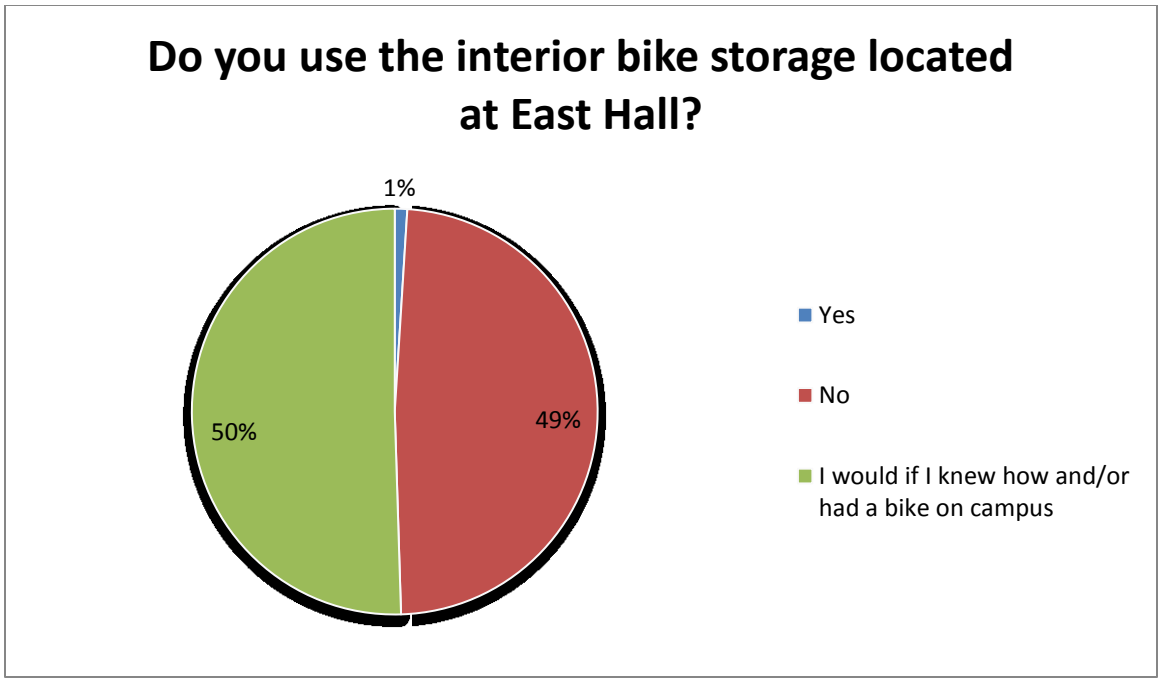


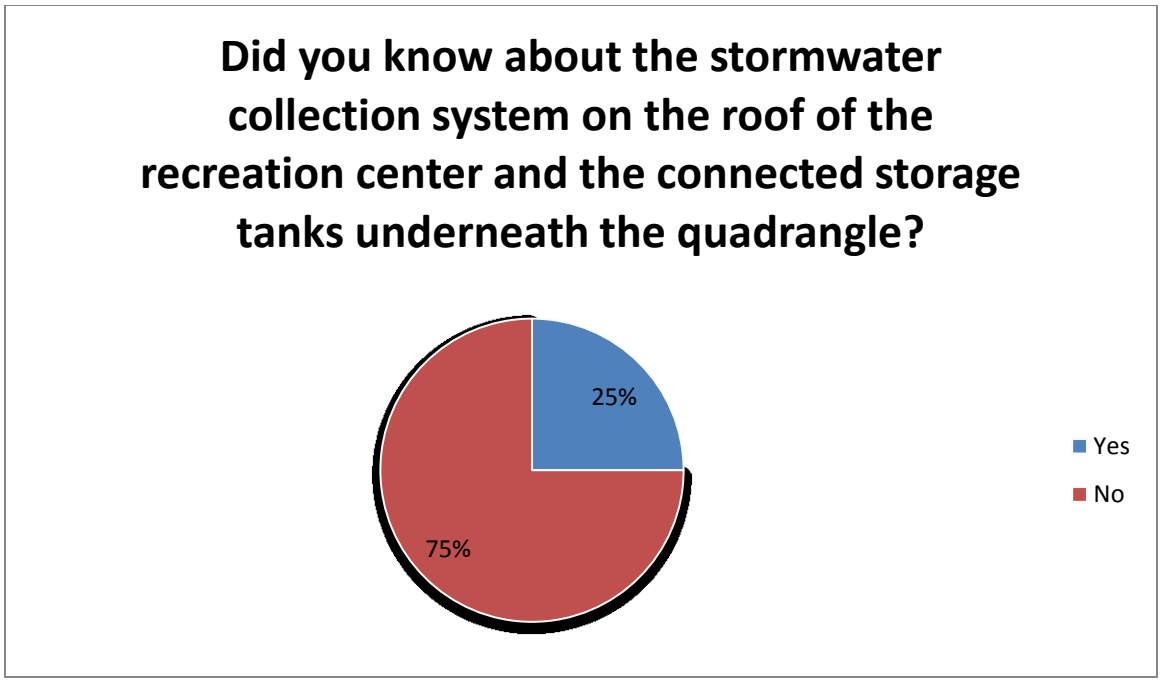
	I don't drive on or around campus	Not Often	Seldom	Often	Very Often
How often do you use the ZipCars?	62	28	7	3	0.5



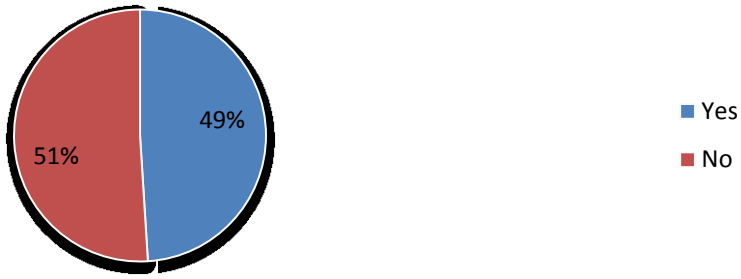

Did you know East Hall has a green rooftop?
36%
64%
Yes
No


Did you know East Hall has interior storage for bikes?
28%
72%
Yes
No

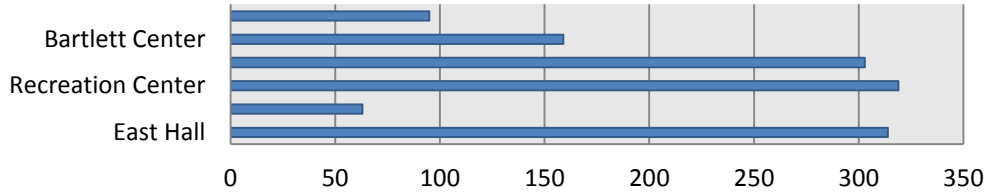

Do you use the interior bike storage located at East Hall?
1%
49%
50%
Yes
No
I would if I knew how and/or had a bike on campus


Did you know about the stormwater collection system on the roof of the recreation center and the connected storage tanks underneath the quadrangle?
25%
75%
Yes
No

Leadership in Energy and Environmental Design (LEED) is a building rating system that was developed by the U.S. Green Building Council. Did you know that since February of 2007, the construction of all new buildings…

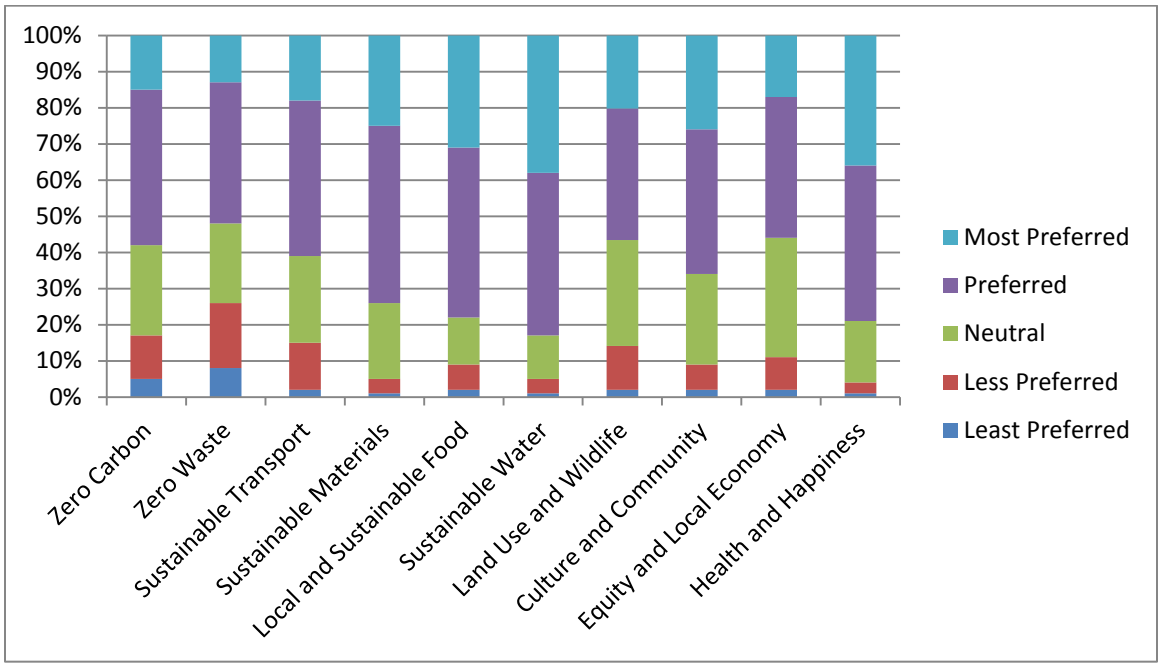


Which WPI buildings have received or are projected to receive a LEED rating of Certified or higher?



	East Hall	Goddard Hall	Recreation Center	10 Faraday	Bartlett Center	Campus Center
Which WPI buildings have received or are projected to receive a LEED rating of Certified or higher?	314	63	319	303	159	95

Appendix L: WPI Community Opinion on the Adoption of each of the OPL Principles by WPI



Principles	Least Preferred	Less Preferred	Neutral	Preferred	Most Preferred
1. Zero Carbon	5%	12%	25%	43%	15%
2. Zero Waste	8%	18%	22%	39%	13%
3. Sustainable Transport	2%	13%	24%	43%	18%
4. Sustainable Materials	1%	4%	21%	49%	25%
5. Local and Sustainable Food	2%	7%	13%	47%	31%
6. Sustainable Water	1%	4%	12%	45%	38%
7. Land Use and Wildlife	2%	12%	29%	36%	20%
8. Culture and Community	2%	7%	25%	40%	26%
9. Equity and Local Economy	2%	9%	33%	39%	17%
10. Health and Happiness	1%	3%	17%	43%	36%

Appendix M: WPI Community Opinion on Given Statements

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. WPI is a sustainable campus.	1%	12%	39%	44%	4%
2. I am familiar with WPI's sustainability efforts.	3%	26%	26%	39%	6%
3. I could give specific examples of efforts made by WPI to become sustainable.	5%	19%	15%	48%	13%
4. I support WPI's sustainability efforts.	1%	1%	13%	39%	46%
5. I would like to get or am currently involved in on-campus sustainability efforts.	7%	22%	35%	28%	8%
6. I recycle when on campus.	1%	2%	5%	41%	51%
7. There are enough recycling bins on campus.	8%	27%	14%	38%	13%
8. When I leave the dining hall or finish eating on campus, I throw leftover food away.	5%	12%	17%	44%	22%
9. Chartwells makes efforts to purchase food from local sources.	3%	11%	57%	26%	3%
10. I would like to see more small-scale sustainability efforts on campus. An example of a small-scale sustainability effort is the installation of high efficiency hand dryers.	3%	2%	13%	46%	36%

Appendix N: "Things that WPI Does Well" Survey Free Response

Themes	Things WPI Does Well	Times Mentioned
Promotion	-Clubs, taskforces, etc for sustainability purposes.	6
	-Clubs and organizations on campus are visible and raise awareness	2
	- I think the work of the Task Force has been very effective and very visible.	1
	-Although there have been sustainability/environmental awareness groups in the past, new organizations such as the Green Team and Eco-reps have emerged and gained greater support from the WPI community	1
		7
	-They encourage recycling.	1
	-Recycling bins placed next to trash can	3
	-Visible recycling bins	2
	-Students are encouraged to reuse old notebooks and to limit the amount of paper used for printing	1
	-They encourage being sustainable	2
	-The GPS courses help in raising awareness of the sustainability efforts on campus	1
	-Trying to implement stronger sustainability morale.	
	-Send emails about recycle mania	1
	-promoting their plan and how they are making WPI a greener campus	4
	-I know it's a small thing, but I like the stickers posted on the paper towel dispensers in the bathrooms. I think they're a small but effective way to make a change.	2
	-Considered a green community	1
Awareness	-WPI does well with understanding that we are not sustainable.	1
	-WPI is headed in the right direction toward sustainability	1
	-They are making efforts to become more sustainable.	4
	-There is a student interest in being sustainable.	1
	-Many students are aware of different sustainability efforts.	1
	- Student efforts towards sustainability	1
	- Student run sustainability initiatives	1
	-Reporting success to major rating institutions like The Sierra Club, Princeton Review, Green Report Card etc.	2
	-I think WPI has a strong commitment to sustainability and has been making moves and creating strategies to be a more green campus	5
	-Awareness	3
	-Making sustainability efforts unobtrusive to normal student operations and habits	1
	-The school has tried very hard to make being green convenient	1
Education	-Focus on sustainability in IQP/MQP program	5
	-WPI trains people to make energy-efficient designs that propagate well beyond the campus borders.	1
	-A fair amount of technically oriented environmental courses	1
	-The Civil Engineering department incorporates sustainability well	

	into the coursework.	**1**
	-WPI has many environmental projects for students to get involved in.	**2**
	-Promotes efforts in classes and education	**1**
	-Stressing the benefits of sustainable development	**2**
	-Education	**1**
	-Information about recycling	**2**
	-Environmental philosophy and ethics classes	**1**
Actions	-Power monitoring with aim to determine HOW to reduce.	**1**
	-They have put meters on many of the buildings to monitor energy usage.	**1**
	-Food waste to farms	**4**
	-Reducing food waste	**2**
	-Food from local farms	**5**
	-Providing gluten free food	**1**
	-Going "paperless"	**7**
	-Reduction of paper use	**3**
	-Filtered drinking water and bottle refill stations	**13**
	-ZipCars	**2**
	-There is a good effort to reduce the water usage	**2**
	-Hand dryers in rec center	**8**
	-Provides public transport between the consortium	**1**
	-Solar panels atop of some light poles	**1**
	-Solar panels on rec center	**4**
	-Solar panels	**4**
	-Electric car chargers	**5**
	-Water efficient toilets	**1**
	-Commitment to green technologies	**3**
	-Providing compostable take-away products at the Goat's Head	**1**
	-Waste management	**2**
	-Motion controlled lights	**4**
	-Maintains a clean environment	**1**
	-Implement a lot of green programs	**1**
	-Controlled proportions in dining hall	**1**
	-WPI takes action rather than waiting for it to become the norm or required	**1**
	-Water efficiency	**1**
	-Computers sleep after period of inactivity	**1**
	-Implementing small scale projects	**2**
	-Green house on Salisbury	**1**
	-Biodegradable disposable eating ware in the Campus Center	**1**
	-Lights on timers	**1**
	-Turning off lights when not in use	**1**
	-Effective resource use	**2**
Recycling	-Recycling x46	**46**
	-Large amount of recycling bins around campus x38	**38**
	-Recycling bins in residence halls x 10	**10**
	-Paper Recycling x11	**11**
	-Plastic recycling x9	**9**

	-Glass recycling x2	**2**
	-Aluminum recycling x2	**2**
	-Food recycling x5	**5**
	-Recycling metals	**1**
	-Recycling electronics x2	**2**
	-I like the fact that the new plates in DAKA are made from recycled products.	**1**
Infrastructure	-LEED certification and LEED certified buildings x16	**16**
	-WPI does a good job of ensuring that all new buildings and renovations are green x31	**31**
	-Green building adaptations x5	**5**
	-The new thermal windows that were put in Alden and the Project Center are good.	**1**
	-Greener Bathrooms in many buildings x3	**3**
	-The new recreation center x16	**16**
	-10 Faraday	**1**
	-East Hall x9	**9**
	-Bartlett Center	**1**
	-New residence halls	**1**
	-I think the new buildings on campus exemplify WPI's efforts but the older buildings and freshmen residence halls fall behind	**1**
	-Individual rooms in new residence halls outfitted with recycling bins	**1**
	-Light dimmers in residence halls	**1**
	-Circulatory cooling in rec center	**1**
	-Rec center built with smart materials	**1**
	-Vines on buildings	**1**
	-It has adequate amount of sustainable facilities on campus	**1**

Appendix O: Suggestions Chart Sorted by Theme and Principle

Principles	Theme 1	Theme 2	Theme 3	Theme "n"
1. Zero Carbon	Theme: Heating/Cooling Reducing energy used for heating and cooling. (5) Fix/replace/upgrade our wasteful HVAC systems. (4) - update HVAC systems for energy savings so that there is money in our budget to allocate to more sustainable efforts. More regulated heating and cooling (3) Heating control in dorms (2) During winter many students open the windows esp. at library when it gets too hot... The windows should be sealed to prevent this or heater changed to individual controls Building temperatures. The heat should not turn on while the ac is cranked and the ac should never	Theme: Lighting Reduce energy used for lighting: -Motion sensor lights (11) -Time sensor lights (2) -Energy efficient light bulbs (2) -Turn lights off at night in the buildings completely. (9) *Rec center mentioned a several times* -Turn off lights when not in use (3) -Green lighting Unnecessary use of electricity. -don't need half the flat screens they installed in the dining hall, and they are constantly running during the day, using energy.	Theme: General Looking into powering w/ solar energy could be cool and generate some MQPs. -Alternative Energy (12) -Renewable Energy (9) -Clean energy (2) -Wind turbines (3) -Solar Panels (13) -More green roofs -Also, a biofuels project center!!! It would be great if all the older buildings could be made more efficient/sustainability without losing their history. (9) *(new insulation & windows, water saving faucets & showers, & more plants on campus)* Decrease carbon	Theme: Comments The lights are always on. Everywhere. Buildings such Higgins Labs often require office space heaters during the summer and windows open during the winter. Alumni and Harrington Gyms normally have upper windows open throughout the winter to moderate the excessive heating. Buildings are heated when there are no classes. Gateway Park is lit like an arcade at night Gateway has motion-detection lighting in labs, but not in the plethora of small side rooms. If you happen to be sitting in a lab

	come on because the heat is too high. I would like a much better temperature sensing system in the buildings. Solar water heaters More green roofs More meatless meals, because eating meat produces more CO2 than driving a car Reducing meat consumption by adopting Meatless Mondays. After all, diet is associated with greater emissions than even transportation. WPI could use a turbine house to help heat and cool WPI buildings. Retrofitting for old buildings and labs i.e. the project center has new windows that are better paned and retain more heat. I'd like to see that happen with buildings such as KH, OH, etc. and other single-paned buildings. (3) -More efficient and intelligent heating/cooling systems.	Reduce computer idle time (2)	emissions High efficient clothes dryer Not adding electric hand dryers employ trash-to-power generation, more electric charging stations electrical power efficiencies Limiting power use Committing AT LEAST to internationally promoted carbon emission reduction goals: 20% reduction by 2020 and 80% by 2050 Committing to ZERO EMISSIONS /carbon neutrality by 2020 is ideal, true leadership More short-distance on-campus housing More of the energy efficient structures.	and don't move enough, you end up in the dark. Not fun. Yet I constantly see lights on in rooms and hallways that are UNOCCUPIED. The entire parking garage is lit up 24/7, yet as far as I can tell, only the first 2 levels are used. The green roof is a cool thing but it provides no benefit to students and comes off more as a tool for tax credits for the school

2. Zero Waste	Theme: Recycling	Theme: Food Waste	Theme: General	Theme: Comments
	More recycling in Res Halls; I wish there was more emphasis on recycling especially in the res halls. (7) More successful recycling program More recycling bins (37) More bins, especially for paper. (8) More bins for plastic. (3) More recycling bins next to trash (3) Single stream recycling (2) Encourage more recycling (8) Recycling bins outside of buildings (2) Recycle cardboard Have places to recycle old batteries, metal and even computers (3) Greek recycling program Info on where students can recycle things like batteries and ink cartridges Diagrams of what can be recycled in each bin. It's not	Composting of food waste.(8) Minimizing food waste (4) There should also be locations/bins on campus to compost food scraps. (2) Extra food at the time of closing at the food court should be provided to students instead of being thrown away. Integrate some sort of anaerobic digestion system to use the food waste from Morgan Commons to create energy used on campus. Also, there should be organic waste receptacles around campus, especially in the campus center, the Goat's Head, and the dorm buildings.	I would like to see all compostable products in place of paper or plastic products in water bottles and plates and utensils. With the change in logo, make sure all paper with old logo is still used and then switch to the new logo. A program to gives information regarding using materials for least produce of waste. More bins to sort waste A sign in Chartwells for more clean plate compost system (3) More reusable bags Minimization of waste	It's also super important to list what items can go in a certain recycling bin, so that people aren't putting cans in paper bins, for instance. In NY, we can pretty much recycle anything. I don't know where I can recycle things like cardboard and paper, and I feel bad throwing them away. I would 100% recycle everything I could if there were more receptacles for all types of products. Even when there are recycling containers nearby, people still toss their recyclable items in the trash. I remember a custodian saying that it didn't matter - it all got put in the dumpster anyway. (3)

	particularly clear. (2) I would like to see a more consistent implementation of recycle bins around campus instead of a scattering of certain types in different buildings; Use a survey to determine where more recycling bins are needed (2)	
3. Sustainable Transport	Encouraging faculty and staff to carpool, walk, bike, or use public transportation. More ZipCars More public transportation Incentives for carpooling. Carpooling effort such as Zimride. More carpooling during travel times Sustainable campus vehicles (SNAP vans, Gateway shuttles). Bike renting system (x9) Bike storage in all residential halls	Theme: Comments The new parking garage will be free, which is disappointing I appreciate the SNAP services, but I feel that their standard schedule rounds use up a lot of fuel. Operating more by call-requests might save the atmosphere some CO2.
4. Sustainable Materials	Less waste of paper towels in bathrooms. Ban ALL plastic bottles (4) Ban Styrofoam (3)	Theme: Comments Is there a way to make Dunkin Donuts waste products more

	Fewer water bottles	environmentally friendly/recyclable?
	High efficiency hand dryers (11)	Why do we support a coffee shop that uses Styrofoam cups?
	Less use of disposable containers and cups.	
	Biodegradable food containers	
	Teach in a way where it isn't required to print out PowerPoint slides or any handouts (just from the book, or have all the notes as a book to buy for each course for like $10) (2)	
	More electronic collection drives	
	WPI could start using paper instead of plastic bags on campus	
	More focus on what chemicals we are using for cleaning purposes	
	The amount of paper waste in the bathrooms should be researched as well as waste in Styrofoam cups from Dunkin Donuts (Patriot's Place in Foxboro, MA has a system specific to accommodate their waste from Dunkin Donuts). (2)	
	Use white rooftops where solar panels are absent	
	Reduce amount of technology bought (x2) -don't need more "just because it's efficient"	
5. Local and Sustainable Food	Theme: Growing/Local Food	
	Maybe growing vegetables or herbs for Chartwells to use on campus.	
	More locally grown food.	

	More local food including meat. Chartwell's meat is highly processed and not local. Chartwells and their dumb "don't carry food out rule" it's just creates more waste, I'm obviously going to eat it. And I paid for it. More farmer's market Purchase land for farming Support permaculture farms More sustainable food options	
6. Sustainable Water	Theme: Bottled Water ELIMINATION of the bottled Dasani water that shows up at every campus event, replacing it with tap water; etc. Less use of bottled water. Stop using plastic bottles Install filtered drinking water and bottle refill stations in key locations(4) More water fountains with filters like the ones at the sports and rec center (5) Ban the sale of disposable water bottles (3) More water bottle fill station/dispensers/fountains (9) Better water fountains (3) Eliminate bottled water - what's wrong with tap water? Just	Theme: Less water usage Toilets: Composting toilets Water-saving toilets (2) Low-flow toilets Flushless toilets Eco-friendly toilets (2) Stronger and more efficient flushes in toilet. (2) More waterless urinals Change shower heads and faucets to efficient ones (2) Less water usage I think that the sprinkler system could be amended; they often seem to be watering trash cans or the street and still go during rain. Also, sometimes it seems like the lawns/plants are watered inefficiently. When walking on campus I see

	think of the transportation costs for all that water, as well as the production and recycling of the bottles. More seltzer water fountains High efficiency washing machines Water in the fountain		sprinklers going off even though it has been raining all day. Grounds and maintenance should be more careful about turning off watering systems. It would be beneficial if there were grey water systems on campus to reduce water use. (2) Reclaim water (2) -ex: treat laundry water and use for lawn Check for leaks Dishwashers/ Improve dish washing in the Goats Head
7. Land Use and Wildlife	More buildings refurbished to be greener, like Goddard Hall. More green buildings (2) Sustainable outlets and buildings Native grass on campus grounds which will need less watering		Theme: Comments Most buildings are not set up for sustainability, only a few of the newest ones Kaven Hall needs help
8. Culture and Community	Theme: Awareness More public knowledge/awareness; Better educate ALL members of campus community so that they do a better job of saving energy, recycling, existing programs/efforts etc. etc. Fun educational events themed around recycling. (25)	Theme: Efforts More publication or small signs saying that things are helping the sustainability efforts when you do them. WPI could put up posters around campus telling people to waste less food and water when taking showers... Normative studies of the environmental crisis required for every students.	Theme: Comments We, as an institution, do not realize that our technical power and learning abilities are not being reflected on campus to the degree that our industries require it. We are putting in a green roof here and there, but if we

Frequently/constantly reaching out to the student body for sustainability ideas. More outreach/opportunities for students to make an impact (3)

There should be an incentive "program" on campus. If students, faculty and staff members bring reusable containers to the food court, they get a discount

I think keeping up with encouraging students to take sustainability to their homes if they live off campus. (2)

Sustainability education!!! For example, as freshman, I was required to go to a "one-night" event which teaches about sexual assault. As a sorority sister, I attended several alcohol and leadership lectures.
However, there is not enough required sustainability education session to put sustainability into great emphasis.

Make efforts more visible
Publicizing what efforts WPI

Requiring that all students take at least one Environmental Studies class before graduation

Requiring engineering courses to incorporate climate change impacts

Creating AT LEAST one course focusing on the problem of Climate Change

Systematically assessing our own MQP and IQP proposal, past and future, concerning how to improve campus sustainability

WPI needs multiple full-time employees and a working budget to accomplish sustainability goals, as well as an Energy Conservation Manager, whose only role is retrofitting and consumption management.(4)
AND giving them a budget so they can actually implement solutions!

I believe that a person should be charged or a position should be created that is solely focused on sustainability.

Community Agriculture/garden (2)

Stronger support from faculty and administration

Sustainability Mascot

Add more greenery, the campus looks more beautiful and the environment looks better by

still do not have enough recycling bins, use water bottles, have no purchasing requirements and use fluorescent light bulbs, then what is the urgency for if we are not being urgent ourselves?

For sustainability to be successful, it needs to be an easy process for people and clear information. Take the guess work out of it. For example, we have recycling bins on campus, but how many people know exactly what can be recycled

	make Change behavior/attitude (3)- some are stubborn, turn off when done Engage/Include Community (11) -spark interest, alumni (2), campaigns, access to green rooftops, Worcester area More sustainability-related projects (3) -IQP,MQP Dorm energy competition	default. More events against pollution The green roof on East is cool and all but it would be cooler if students had the option to manage / moderate the project. could be a nice elective
9. Equity and Local Economy	A braver mindset, politically. More of a focus on climate change, and a commitment to do something about it as an institution. A recognition that working for unsustainable industries as an engineer is counter to the idea of sustainability. A willingness to question itself for what is right. An aversion to hollow measures that are designed for marketing purposes. And WPI should investigate becoming a fair trade campus. Signing the American College & University Presidents' Climate Commitment Adopting language concerning climate change as a planetary emergency in the WPI mission statement Using sustainability and the values of the WPI mission	Theme: Money Divesting from fossil fuels and investing our endowment in socially responsible investments. (3) In addition, more funding for technology with low power requirements would be amazing! More transparency (2) Being sponsored by/strongly featuring an oil company should be changed Establishing a revolving Green Fund to finance sustainability initiatives Money towards energy conservation

	statement as one criterion by which Honorary Degrees and Commencement Speakers are chosen- WPI is currently considered a laughingstock for awarding ExxonMobil CEO Rex Tillerson. -Green-washing: We tout how sustainable we are even though we have made ZERO commitment to reducing our carbon emissions in a timely fashion and even as of 2011 awarded an Honorary Degree to the CEO of Exxon Mobil Use WPI mission to incorporate sustainability Connect with big sustainability-focused companies Input from other schools (Tufts) Higher priority to principles with greater impact	Everything Cost-neutral (or ROI in ~3yrs) Invest in sustainable technology
10. Health and Happiness	Moving Chartwell's away from processed foods and increasing awareness of healthy eating. Also, it'd be nice if there was some organic food (and we *knew* it was organic). Organic food is healthier, has less pesticides and/or hormones, both of which are very harmful for people AND the environment. I would love for WPI to have its own student run garden. Show commitment Less focus on “feel-good” efforts (2) Bike path near campus More healthy food options	Theme: Comments These "sustainability" efforts hurt our standards of living. The new sports center contains within itself many examples of how these "sustainability" efforts make life less enjoyable and sometimes even less healthy. Action > Words Fix WPI wireless
General	- More small improvements (5), more efforts, more large scale/long term efforts (2), better implementation,	

Comments/ Suggestions	more greener technology, improve all aspects of sustainability - More of the "more efficient" products seen in the likes of East, etc. - More efforts to monitor energy and water use on campus so that it can be reduced. - I don't know enough about the efforts as are to make suggestions... (8) - I am faculty so I don't know what is done in residence halls. - Pool of employees and staff to split CSA shares - I am comfortable with current level of efforts. I'm very much against "feel-good" initiatives that reduce efficiency without commensurate gain. - Actual in-affect work is hard to see - Eliminating paper towels in favor of electric dryers is a perfect example of misguided sustainability efforts. To turn a tree into paper, it must first grow for 20 years. The land where it is grown must be set aside and left alone, where it serves as habitat for wildlife and a carbon sink. Electric dryers must be fueled by natural gas, coal, or nuclear power. - I'm not really sure, but I will say that the campus doesn't strike me as "very sustainable". Hopefully this IQP will find some improvements that can be made! - Too much environmental propaganda with questionable origin and lack of factual data is presented in classes. - The green roof is a cool thing but it provides no benefit to students and comes off more as a tool for tax credits for the school - Shorten the message and events to appeal to a larger audience - More trash cans to avoid littering - Making WPI sustainable takes time, man power, financial backing, and time to change campus culture

Appendix P: Authorship

Section Number	Section	Author	Editor 1	Editor 2
	Abstract	Madeline	Natasha	
	Acknowledgements	Kimberly	Madeline	
	Executive Summary	Madeline	Kimberly	Natasha
	List of Figures	Madeline		
	List of Tables	Madeline		
1	Introduction	Madeline	Kimberly	Natasha
2	Literature Review			
2.1	Defining Sustainable Development	Kimberly	Madeline	Natasha
2.1.1	The Need for Sustainable Development	Kimberly	Madeline	Natasha
2.1.1.1	Carbon Emissions	Kimberly	Madeline	Natasha
2.1.1.2	Energy Consumption	Kimberly	Madeline	Natasha
2.1.1.3	Improper Waste Management	Natasha	Madeline	Kimberly
2.1.1.4	Non-Sustainable Food Production	Natasha	Madeline	Kimberly
2.1.2	Social Responsibility and Higher Education	Kimberly	Madeline	Natasha
2.2	BioRegional	Natasha	Madeline	Kimberly
2.2.1	Beddington Zero Energy Development	Natasha	Madeline	Kimberly
2.2.2	One Planet Living	Natasha	Madeline	Kimberly
2.2.3	WPI's Relationship with BioRegional	Natasha	Madeline	Kimberly
2.3	College-Focused Sustainability Organizations	Madeline	Kimberly	Natasha
2.3.1	Association for the Advancement of Sustainability in Higher Education	Madeline	Kimberly	Natasha
2.3.2	American College and University Presidents' Climate Commitment	Madeline	Kimberly	Natasha
2.3.3	GreenerU, Inc.	Madeline	Kimberly	Natasha
2.4	Sustainability at Worcester Polytechnic Institute	Kimberly	Madeline	Natasha
2.4.1	The President's Task Force on Sustainability	Kimberly	Madeline	Natasha
2.4.2	Development of the Campus Sustainability Plan	Kimberly	Madeline	Natasha
2.4.3	Sustainability Focused Student Clubs and Organizations	Kimberly	Madeline	Natasha
2.4.4	Campus Buildings and Grounds	Kimberly	Madeline	Natasha
2.4.5	Transportation	Kimberly	Madeline	Natasha
2.4.6	Sustainability Assessment	Kimberly	Madeline	Natasha
2.4.7	Further Investigation	Natasha	Madeline	Kimberly
3	Methodology			
3.1	Introduction	Madeline	Kimberly	Natasha
3.2	Assessing WPI's Sustainability Status	Madeline	Kimberly	Natasha
3.2.1	Document Review	Natasha	Madeline	Kimberly
3.2.2	Interviews	Natasha	Madeline	Kimberly
3.2.2.1	Faculty and Staff Interviews	Kimberly	Madeline	Natasha

3.2.2.2	Student Group Interviews	Kimberly	Madeline	Natasha
3.2.3	Interactive Presentation	Natasha	Madeline	Kimberly
3.3	Involving the WPI community in Integration of the OPL Principles	Madeline	Kimberly	Natasha
3.4	Creation of the Integration Plan	Madeline	Kimberly	Natasha
3.5	Proposing the Plan to the President's Task Force	Madeline	Kimberly	Natasha
4	Findings and Recommendations			
4.1	Introduction	Madeline	Kimberly	Natasha
4.2	Principle Specific Findings and Recommendations	Madeline	Kimberly	Natasha
4.2.1	Zero Carbon	Madeline	Kimberly	Natasha
4.2.2	Zero Waste	Madeline	Kimberly	Natasha
4.2.3	Sustainable Transport	Madeline & Natasha	Kimberly	
4.2.4	Sustainable Materials	Kimberly	Natasha	Madeline
4.2.5	Local and Sustainable Food	Kimberly	Natasha	Madeline
4.2.6	Sustainable Water	Madeline	Kimberly	Natasha
4.2.7	Land Use and Wildlife	Natasha	Madeline	Kimberly
4.2.8	Culture and Community	Natasha	Madeline	Kimberly
4.2.9	Equity and Local Economy	Kimberly	Natasha	Madeline
4.2.10	Health and Happiness	Natasha	Madeline	Kimberly
4.3	Broad Recommendations	Madeline		
4.3.1	Adoption of One Planet Living Principles	Madeline		
4.3.2	Creation of a Sustainability Coordinator Position and/or Sustainability Office	Madeline		
4.3.3	Improve Upon LEED Ratings	Madeline		
4.3.4	Interactive Qualifying Projects for One Planet Living Integration	Madeline		
5	Conclusions	Madeline		
	Bibliography	Natasha		
Appendix A	Common International Targets			
	Community Specific			
	Business and Organization Specific			
Appendix B	Principles Matrix	All		
Appendix C	Interview Questions for Chris Sontag	All		
Appendix D	Interview Questions for John Orr	All		
Appendix E	Interview Questions for Elizabeth Tomaszewski	All		
Appendix F	Interview Questions for Christine Girouard	All		
Appendix G	Interview Questions for Ryan Pollin	All		
Appendix H	Interview Questions for Past BioRegional IQP team	All		
Appendix I	"What do YOU want for WPI Sustainability?" Survey	All		
Appendix J	Sustainability Comparison Matrix	All		
Appendix K	Survey Questions Demonstrating WPI Community Knowledge on WPI Sustainability Efforts	Madeline		
Appendix L	WPI Community Opinion on the Adoption of each of the OPL Principles by WPI	Madeline		

Appendix M	WPI Community Opinion on Given Statements	Madeline		
Appendix N	“Things that WPI Does Well” Survey Free Response	Madeline		
Appendix O	Suggestions Chart Sorted by Theme and Principle	Kimberly & Natasha	Madeline	